6. OPERATIONAL PHASE IMPACT ASSESSMENT

TRAFFIC IMPACTS – EXISTING RECEPTORS

6.1. As set out in Section 3, the screening process highlighted that a full impact assessment was required for the proposed development, based on the number of daily development trips exceeding the Stage 2 criteria in the EPUK & IAQM (2017) guidance.

2026 Impact Assessment Without Cumulative Traffic – Operational Phase Traffic

6.2. The '2026 Baseline' NO_2, PM_{10} and $PM_{2.5}$ concentrations at the previously specified human receptor locations, as set out in Appendix B, have been compared to the '2026 Baseline + proposed development' concentrations and the results are set out in the tables in Appendix G. The tables also set out the impact descriptor, considered against the annual mean air quality standards set out in Table 1, at each receptor location in line with the assessment matrix set out in Table 4.

NO_2

6.3. The modelled NO_2 concentrations in Table G.1 show that NO_2 concentrations at one of the specified residential receptor locations are above the annual mean objective (40 µg/m^3). The highest concentration recorded is 60.2 µg/m^3 at R29 (John O Gaunts, Hickleton), located on the façade of the building fronting onto the A635. This receptor is predicted to experience an annual concentration increase of 5.1 µg/m^3.

6.4. Using the matrix in Table 4, it can be seen that the impacts on the majority of existing residential receptors in Hickleton are anticipated to be **negligible (adverse) to slight (adverse)**,with **substantial (adverse)** impacts predicted at R29 and R30, the John O Gaunts dwelling. **Moderate (adverse)** impacts are also predicted at R11 and R12 (6, the Mews, Hickleton) and at R22 (19, Hickleton), however, these receptors are not expected to experience concentrations above the annual mean objective (40 µg/m^3)

6.5. The annual average mean concentration at one receptor location (R29) exceeds 60 µg/m^3, indicating that the receptors would experience an exceedance of the 1-hour mean objective, in line with paragraph 7.97 of LAQM.TG(22). The remaining receptors, including those representative of short-term exposure, are not predicted to exceed the 60 µg/m^3 indicator.

PM_{10}

6.6. The modelled PM_{10} concentrations in Table G.2 do not predict any exceedances of the annual mean objective (40 µg/m^3) at any of the specified receptor locations. Receptor R29 is

predicted to be the highest modelled concentration, and is predicted to experience an annual concentration increase of 1.0 µg/m^3.

6.7. Using the matrix in Table 4, it can be seen that the impacts are anticipated to be **negligible (adverse)** at all modelled residential receptors.

6.8. For PM_{10}, the following equation can be used to derive the number of days that the 24-hour mean objective (50 µg/m^3) is likely to be exceeded.

$$\text{Num. 24-hour exceedances} = -18.5 + 0.00145 \times \text{annual mean}^3 + \left(\frac{206}{\text{annual mean}}\right)$$

6.9. There are limitations to this calculation, and this is set out in LAQM.TG(22), which states:

> *"The relationship does have limitations in so far that it should not be applied when the annual mean PM_{10} concentration is lower than 14.8 µg/m^3."*

6.10. On the basis that all of receptors are above 14.8 µg/m^3, the formula above can be used to inform the number of 24-hour mean objective exceedances.

6.11. The highest annual mean PM_{10} concentration is 25.1 µg/m^3, predicted at R29 in 2026. Based on the formula above, this predicts 12.7 exceedance days, which is below the 35-days annual limit. It is therefore thought that this receptor (John O Gaunts, Hickleton) would not be exposed to be impacted from short-term concentrations of PM_{10}.

$PM_{2.5}$

6.12. The modelled $PM_{2.5}$ concentrations in Table G.3 do not predict any exceedances of the Stage 2 Post 2020 annual mean limit (20 µg/m^3) at any of the specified receptor locations. Receptor R29 is predicted to be the highest modelled concentration, and is predicted to experience an annual concentration increase of 0.6 µg/m^3.

6.13. Using the matrix in Table 4, it can be seen that the impacts are anticipated to be **negligible (adverse)** at all modelled residential receptors.

Significance of Impacts

6.14. The impacts on the majority of residential receptors modelled are anticipated to be **negligible (adverse)** to **slight (adverse)** for NO_2, with the exception of four receptors, two of which are anticipated to experience a **moderate (adverse)** impact, and two receptors, which are associated with 6, The Mews and the John O Gaunts, Hickleton dwelling. The John O Gaunts receptors are predicted to experience a **substantial (adverse)** impact as a result of proposed development traffic, with concentrations exceeding the annual mean objective. The NO_2 1-hour mean objective is expected to be exceeded at John O Gaunts, Hickleton.

6.15. The PM_{10} impacts on all modelled residential receptors are predicted to be **negligible (adverse)**. The PM_{10} 24-hour mean objective is not expected to be exceeded at John O Gaunts dwelling.

6.16. The $PM_{2.5}$ impacts on all modelled residential receptors are predicted to be negligible **(adverse)**.

6.17. Although the EPUK & IAQM (2017) states that a substantial adverse impact at one or more receptor location, may not always be judged as being 'significant', the guidance goes on to state:

> *"Where the air quality is such that an air quality objective at the building façade is not met, the effect on residents or occupants will be judged as significant, unless provision is made to reduce their exposure by some means."*

6.18. On this basis, and in accordance with the EPUK & IAQM (2017) guidance, as substantial impacts have been identified that exceed both the NO_2 annual mean and 1-hour mean objective, the overall impacts are considered '**significant**' at the John O Gaunts dwelling.

6.19. Whilst it is noted that 6, The Mews is predicted to experience a moderate (adverse) impact for NO_2, the EPUK & IAQM (2017) states:

> *"An individual property exposed to a moderately adverse impact might not be considered a significant effect, but many hundreds of properties exposed to a slight adverse impact could be. Such judgements will need to be made taking into account multiple factors."*

6.20. On the basis that this single receptor is not predicted to exceed the annual mean objective, the impact can be considered to be 'not significant.'

6.21. It should be noted that within the baseline scenario, the concentrations at this dwelling are exceeding the NO_2 annual mean objective. It is not clear if any mitigation has been considered for this dwelling due to the existing air quality issues.

<u>2026 Impact Assessment With Cumulative Traffic – Operational Phase Traffic</u>

6.22. The '2026 Baseline' NO_2, PM_{10} and $PM_{2.5}$ concentrations at the previously specified human receptor locations, as set out in Appendix B, have been compared to the '2026 Baseline + Proposed Development (with cumulative traffic)' concentrations and the results are set out in the tables in Appendix H. The tables also set out the impact descriptor, considered against the annual mean air quality standards set out in Table 1, at each receptor location in line with the assessment matrix set out in Table 4.

NO_2

6.23. The modelled NO_2 concentrations in Table H.1 show that NO_2 concentrations at one of the specified residential receptor locations are above the annual mean objective (40 µg/m^3). The highest concentration recorded is 62.0 µg/m^3 at R29 (John O Gaunts, Hickleton), located on the façade of the building fronting onto the A635. This receptor is predicted to experience an annual concentration increase of 6.9 µg/m^3.

6.24. Using the matrix in Table 4, it can be seen that the impacts on the majority of existing residential receptors in Hickleton are anticipated to be **negligible (adverse) to slight (adverse)**,with **substantial (adverse)** impacts predicted at R29 and R30, the John O Gaunts dwelling. **Moderate (adverse)** impacts are also predicted at R11 (6, the Mews, Hickleton) and at R31 (John O Gaunts dwelling), however, these receptors are not expected to experience concentrations above the annual mean objective.

6.25. The annual average mean concentration at one receptor location (R29) exceeds 60 µg/m^3, indicating that the receptors would experience an exceedance of the 1-hour mean objective, in line with paragraph 7.97 of LAQM.TG(22). The remaining receptors, including those representative of short-term exposure, are not predicted to exceed the 60 µg/m^3 indicator.

PM_{10}

6.26. The modelled PM_{10} concentrations in Table H.2 do not predict any exceedances of the annual mean objective (40 µg/m^3) at any of the specified receptor locations. Receptor R29 is predicted to be the highest modelled concentration, and is predicted to experience an annual concentration increase of 1.3 µg/m^3.

6.27. Using the matrix in Table 4, it can be seen that the impacts are anticipated to be **negligible (adverse)** at all modelled residential receptors.

6.28. For PM_{10}, the following equation can be used to derive the number of days that the 24-hour mean objective (50 µg/m^3) is likely to be exceeded.

$$\text{Num. 24-hour exceedances} = -18.5 + 0.00145 \times \text{annual mean}^3 + \left(\frac{206}{\text{annual mean}}\right)$$

6.29. There are limitations to this calculation, and this is set out in LAQM.TG(22), which states:

> *"The relationship does have limitations in so far that it should not be applied when the annual mean PM_{10} concentration is lower than 14.8 µg/m^3."*

6.30. On the basis that all of receptors are above 14.8 µg/m^3, the formula above can be used to inform the number of 24-hour mean objective exceedances.

6.31. The highest annual mean PM_{10} concentration is 25.5 µg/m^3, predicted at R29 in 2026. Based on the formula above, this predicts 13.6 exceedance days, which is below the 35-days annual limit. It is therefore thought that this receptor (John O Gaunts, Hickleton) would not be impacted from short-term concentrations of PM_{10}.

$PM_{2.5}$

6.32. The modelled $PM_{2.5}$ concentrations in Table H.3 do not predict any exceedances of the Stage 2 Post 2020 annual mean limit (20 µg/m^3) at any of the specified receptor locations. Receptor R29 is predicted to be the highest modelled concentration, and is predicted to experience an annual concentration increase of 0.8 µg/m^3.

6.33. Using the matrix in Table 4, it can be seen that the impacts are anticipated to be **negligible (adverse)** at all modelled residential receptors.

Significance of Impacts

6.34. The impacts on the majority of residential receptors modelled are anticipated to be **negligible (adverse)** to **slight (adverse)** for NO_2, with the exception of four receptors, two of which are anticipated to experience a **moderate (adverse)** impact at 6, The Mews, and the John O Gaunts, Hickleton dwelling. The John O Gaunts receptors are predicted to experience a **substantial (adverse)** impact as a result of the development with cumulative traffic, with concentrations exceeding the annual mean objective. The NO_2 1-hour mean objective is expected to be exceeded at John O Gaunts, Hickleton.

6.35. The PM_{10} impacts on all modelled residential receptors are predicted to be **negligible (adverse)**.The PM_{10} 24-hour mean objective is not expected to be exceeded at John O Gaunts dwelling.

6.36. The $PM_{2.5}$ impacts on all modelled residential receptors are predicted to be negligible **(adverse)**.

6.37. Although the EPUK & IAQM (2017) states that a substantial adverse impact at one or more receptor location, may not always be judged as being 'significant', the guidance goes on to state:

> *"Where the air quality is such that an air quality objective at the building façade is not met, the effect on residents or occupants will be judged as significant, unless provision is made to reduce their exposure by some means."*

6.38. On this basis, and in accordance with the EPUK & IAQM (2017) guidance, as substantial impacts have been identified that exceed both the NO_2 annual mean and 1-hour mean

objective, the overall impacts are considered '**significant**' at the John O Gaunts dwelling. The significance for post-mitigation has been determined in Section 7.

6.39. It should be noted that within the baseline scenario, the concentrations at this dwelling are exceeding the NO_2 annual mean objective. It is not clear if any mitigation has been considered for this dwelling due to the existing air quality issues.

6.40. Whilst it is noted that 6, The Mews is predicted to experience a moderate (adverse) impact for NO_2, the EPUK & IAQM (2017) states:

> *"An individual property exposed to a moderately adverse impact might not be considered a significant effect, but many hundreds of properties exposed to a slight adverse impact could be. Such judgements will need to be made taking into account multiple factors."*

6.41. On the basis that this single receptor is not predicted to exceed the annual mean objective, the impact can be considered to be 'not significant.'

7. MITIGIATION DISCUSSION

INTRODUCTION

7.1. As set out in Section 5 and Section 6, the impact of both the construction and operation phases at one residential dwelling (John O Gaunts) is causing 'significant' adverse impacts, when considering both the development in isolation and in conjunction with the cumulative development traffic. The results suggest that both the proximity of this receptor to the A635, as well as the high number of heavily polluting HGVs travelling to/from the A1(M), through Hickleton are the cause of this issue. The HGVs make up at least 13.8% of the baseline flows, and this is expected to increase to 16.9% as a result of the proposed development. The issue of proximity is highlighted by the fact that receptors located further back from the A635 are typically experiencing negligible (adverse) to slight (adverse) impacts.

7.2. It is, therefore, considered that site specific mitigation measures, in addition to those typically required during planning, are required within Hickleton, and at this specific dwelling (John O Gaunts), due to this development. It is worth noting that there are a number of committed developments that will also impact receptors within Hickleton, and therefore any future development should also consider the impacts and contribute to any mitigation.

7.3. In line with the requirements of the site allocation (*ES10 Land South of Dearne Valley Parkway)* within the Barnsley Local Plan, a detailed review of potential mitigation options have been considered. When considering the possible mitigation options, the following documents have been consulted / considered and discussed in turn below:

- Planning Practice Guidance (2019);
- Department for Environment, Food and Rural Affairs, 2010. Low Emissions Strategies (using the planning system to reduce transport emissions) Good Practice Guidance;
- Environmental Protection UK (EPUK) & IAQM (2017) *Land-Use Planning and Development Control: Planning for Air Quality;*
- IAQM (2018). *Mitigation of Development Air Quality Impacts*. Version 1.1;
- BMBC (2021) *Air Quality and Emissions Good Practice Planning Guidance*;
- CDC (2022) *Air Quality Technical Planning Guidance*;
- CDC (2022) *Real World Driving Emission Study*; and
- CDC(2018) *Doncaster Metropolitan Borough Council Air Quality Action Plan*.

7.4. Two mitigation approaches have been considered within this report, a national approach, which uses industry recognised air quality guidance and national policy, and a local approach,

which utilises local guidance documents and policies. These approaches have been set out below.

NATIONAL APPROACH

Planning Practice Guidance

7.5. Paragraph 008 Reference ID: 32-008-20191101 of the PPG sets out potential mitigation options and is clear that *"options will need to be locationally specific, will depend on the proposed development and need to be proportionate to the likely impact".* The key areas which have been considered and potentially feasible to achieve within the extensive list of mitigation options are:

- Appropriate means of filtration and ventilation;
- including infrastructure to promote modes of transport with a low impact on air quality (such as electric vehicle charging points); and
- Contributing funding to measures, including those identified in air quality action plans and low emission strategies, designed to offset the impact on air quality arising from new development.

7.6. These mitigation options have been considered further throughout this Section. As per the guidance: *"it is important that local planning authorities work with applicants to consider appropriate mitigation so as to ensure new development is appropriate for its location and unacceptable risks are prevented."*

Institute of Air Quality Management (IAQM) (2018) Position Statement - *Mitigation of Development Air Quality Impacts*

7.7. The IAQM have issued a position statement[41] in relation to the mitigation of development air quality impacts. Within this statement, the IAQM (2018) recommends that the following basic hierarchy be used for mitigating the operational air quality impacts associated with a particular development:

i. Preference should be given to preventing or avoiding exposure/impacts to the pollutant in the first place by eliminating or isolating potential sources or by replacing sources or activities with alternatives. This is usually best achieved through taking air quality considerations into account at the development scheme design stage.

[41] Institute of Air Quality Management, 2018. *Mitigation of Development Air Quality Impacts. Version 1.1.*

ii. Reduction and minimisation of exposure/impacts should next be considered once all options for prevention/avoidance have been implemented so far as is reasonably practicable (both technically and economically).

iii. Off-setting a new development's air quality impact by proportionately contributing to air quality improvements elsewhere (including those identified in air quality action plans and low emission strategies) should only be considered once the solutions for preventing/avoiding, and then for reducing/minimising, the development-specific impacts have been exhausted.

7.8. To note, the position statement also states the following with respect to the above hierarchy:

"This hierarchy is suitable both for impacts caused by a potentially polluting new development, and for the impact of exposure of new occupants of a development proposed in an area of existing poor air quality."

Preventing or Avoiding

7.9. Whilst it is possible to explore alternative highway routes, such as a specified routing plan, to get to the A1(M), this may have wider viability implications in terms of future occupiers. Therefore, the next step is the be on reduction and minimisation of exposure/impacts on the impacted existing residential receptors which are predicted to experience 'Significant' impacts.

7.10. To note, a significant prevention and avoidance mitigation measure of exposure/impacts is the construction of the A1-A19 Hickleton Bypass, which has been put forward as a possible measure funded through the new Network Noth Plan[42]. This would see traffic eased through Hickleton, thus reducing the impact of the development on the village and improving the existing air quality issues. A business case for this has yet to be put forward, and therefore cannot be considered as a 'committed measure.'

Reduction and Minimisation

7.11. As the impacted buildings already exist, it is not possible to consider air quality within the design process. Therefore, the best and most plausible option would be to provide suitable air quality mitigation on the fresh air opening on these impacted dwellings, in the form of Mechanical Ventilation with Heat Recovery (MVHR) systems with filtration. MVHR systems are suitable for both newbuild and existing buildings and work best in buildings with high levels of airtightness and insulation. It should be noted that the position statement does state the following:

[42] Department for Transport, 2023. Network North: Transporting British Transport

"the efficacies and costs of the different mitigation options should be taken into account; as more research and operational data become available on these, the use of this hierarchy as a selection tool can be expected to move from a mainly qualitative towards a more quantitative basis."

7.12. Examples of possible filtration include (but are not limited to):

- HEPA filers;
- Carbon (activated) filters; and
- Electrostatic precipitators.

7.13. An example of a system that could be installed on the impacted residential dwellings is the Airclean - Indoor Air Quality Filtration System[43] – NO_x, Nitrogen Dioxide, Sulphur Dioxide, VOC, PM_{10}, $PM_{2.5}$.

7.14. To note, an M&E engineer should be consulted on the possibility of using any filtration. It is important that any fresh air intakes for the systems are situated towards the rear of the dwelling, away from the main pollution source which is the A635. Furthermore, any proposed ventilation should consider the most up to date version of Approved Document F of the Building Regulations, which sets out a number of factors that need to be considered. Any systems and filtration should be agreed with the council.

7.15. Based on the adoption of the filtration mitigation, the significance post-mitigation at the John O Gaunts receptor, for both the construction and operational phase (both with and without the impact of cumulative development traffic), can be considered to be 'not significant' (subject to the correct installation, operation and maintenance of the filtration system), as the filtration system (Airclean - Indoor Air Quality Filtration System) indicates that up to 90% of NO_x/NO_2 emissions can be removed. This would mean that the concentrations within the John O Gaunts property, assuming performing at optimal efficiency, would be expected to be below the annual mean objective for NO_2.

7.16. The funding for this mitigation route which is proposed is expected to be secured through a financial contribution to CDC, secured through BMBC (as the determining authority), which would be made available to the impacted residential receptor. The value of such financial contribution is set out in Appendix H, and is discussed below.

7.17. A number of mitigation measures will be required at a local level, which aim to reduce emissions from vehicles. These are set out in the Local Approach section below.

Off-setting

[43] Airclean Ltd. Indoor Air Quality Filtration System – NO_x, Nitrogen Dioxide, Sulphur Dioxide, VOC, PM_{10}, $PM_{2.5}$. Accessible at: https://www.airclean.co.uk/indoor-air-quality-filtration/indoor-air-quality-filter-system/

7.18. The impacts on air quality as a result of the proposed development, in isolation of any cumulative impacts, can be quantified in a damage cost calculation, in line with the CDC (2022) Air Quality Technical Planning Guidance. This damage cost approach is the same as that set out in the BMBC (2021) Air Quality and Emissions, Good Practice Planning Guidance, and is consistent with that seen at a national level. The proportion of traffic travelling through the village of Hickleton has been used within the damage calculation, which predicts the emission changes through the village as a result of the proposed development. This overall cost determines the level of mitigation compensation required to negate the impact of the proposed development. The damage cost calculation is set out in Appendix H, which has been calculated at £176,370.15.

7.19. To note, a separate damage calculation has been carried out for the site as a whole, which is set out in the ES supporting the planning application. The damage cost for the whole application site, which has been split based on the size of each plot, is set out in the table below.

Table 12 Damage Cost Split by Plot – Whole Development

Plot	Size (m^2)	Damage Cost (£)
1	52,815	£184,709.31
2	34,374	£120,215.81
3	78,038	£272,921.43
4	32,052	£112,095.10
Total		**£689,941.66**

7.20. The air quality impact on Hickleton should be considered under the same damage cost as the whole development, as the traffic travelling through the village is a proportion of the traffic generated from the proposed development as a whole. Therefore, the damage cost for Hickleton alone should be incorporated into the damage cost for the whole scheme. Table 13 sets out the redistributed damage costs for each plot and for Hickleton.

Table 13 Damage Cost Split by Plot – Including Hickleton

Plot	Size (m^2)	Damage Cost (£)
1	52,815	£137,491.97
2	34,374	£89,484.98
3	78,038	£203,154.38
4	32,052	£83,440.17

Hickleton	N/A	£176,370.15
Total		**£689,941.66**

7.21. To note, the EPUK & IAQM (2017) guidance states the following regarding the incorporation of additional measures to offset emissions:

> *"It is important that obligations to include offsetting are proportional to the nature and scale of development proposed and the level of concern about air quality; such offsetting can be based on a quantification of the emissions associated with the development. These emissions can be assigned a value, based on the "damage cost approach" used by Defra, and then applied as an indicator of the level of offsetting required, or as a financial obligation on the developer. Unless some form of benchmarking is applied, it is impractical to include building emissions in this approach, but if the boiler and CHP emissions are consistent with the standards as described above then this is not essential."*

7.22. As per bullet point iii of the IAQM (2018) position statement, this damage cost figure should be proportionately contributing to air quality improvements, and in this case, the calculated figure specific to Hickleton this should be put towards air quality improvements within the village.

7.23. As per the IAQM (2018) interim position, off-setting the proposed developments impact should be done by proportionately contributing to air quality improvements elsewhere (including those identified in air quality action plans). A review of the CDC AQAP and Real World Driving Emissions Study which has been carried out and specific actions proposed, set out in Section 2, suggests that the council are not proposing any specific mitigation measures within Hickleton.

7.24. At this stage it is unclear how the applicant can support the measures listed in the current AQAP. Whilst it is understood that a new AQAP specific to Hickleton is being prepared, this has not yet been made available to us. However, during discussions with Doncaster and Barnsley, a highway improvement scheme was put forward, which would see the junction to the east of Hickleton (between the A635 and Hickleton Road and Red Hill Lane) staggered. The staggered junction in theory should ease any congestion along the A635 backing into the village of Hickleton, as vehicles turning into Hickleton Road or Red Hill Lane will not be stationary in the main highway, which ultimately will allow traffic to be free flowing.

<u>EPUK & IAQM - Land-Use Planning and Development Control: Planning for Air Quality</u>

7.25. The EPUK & IAQM (2017) document sets out the in Section 5 the principles of 'Better by Design'. Paragraph 5.4 of the document states:

> *"Effective spatial planning can reduce the need to travel by car to the workplace…"*

7.26. Furthermore, the following good practice principles should be applied to all developments:

- Design phase
  - New developments should not contravene the Council's Air Quality Action Plan, or render any of the measures unworkable;
  - Wherever possible, new developments should not create a new "street canyon," or a building configuration that inhibits effective pollution dispersion;
  - Delivering sustainable development should be the key theme of any application;
  - New development should be designed to minimise public exposure to pollution sources, e.g. by locating habitable rooms away from busy roads, or directing combustion generated pollutants through well sited vents or chimney stacks.
- Operational phase
  - The provision of at least 1 Electric Vehicle (EV) "fast charge" point per 10 residential dwellings and/or 1000m^2 of commercial floorspace. Where on-site parking is provided for residential dwellings, EV charging points for each parking space should be made.
  - Where development generates significant additional traffic, provision of a detailed travel plan (with provision to measure its implementation and effect) which sets out measures to encourage sustainable means of transport (public transport, cycling and walking) via subsidised or free-ticketing, improved links to bus stops, improved infrastructure and layouts to improve accessibility and safety.

7.27. It is understood that through the implementation of local policy and guidance, as set out below, a number of these measures will be included for the proposed development, including a detailed travel plan and electric vehicle charging points in line with the local authority requirements.

LOCAL APPROACH

7.28. In addition to the mitigation strategy set out above, there is a requirement for a number of additional measures to be in place, which will ultimately reduce the emissions resulting from the operational phase of the proposed development.

7.29. Using the local guidance documents produced by BMBC (Air Quality and Emissions, Good Practice Planning Guidance) and CDC (Air Quality Technical Planning Guidance), the proposed development is classified as 'Major' using both classifications. Therefore, both guidance documents require a damage cost calculation, in line with national guidance, to determine the

level of mitigation compensation required to offset the proposed development. The damage cost attributed to the impact on the village of Hickleton, and the impact of the proposed development as a whole, has been set out in the National Approach section above.

7.30. Both guidance approaches set out the requirement for Type 1, Type 2 and Type 3 mitigation for developments classified as 'Major'. As specific occupiers have not yet been identified, specific mitigation measures for each plot cannot be specified. However, mitigation examples for each of these categories has been set out below, and should be considered for the proposed development (and used as offsetting measures).

Type 1:

- Doncaster
  - For business/staff usage 1 charging point per 10 staff parking spaces.
  - Mode 3, minimum 7 kW (32 AMP) for commercial/retail/industrial development.
- Barnsley
  - 10% of parking spaces for Industrial
  - Mode "3", minimum 7 kW (32 AMP) for commercial/retail/industrial development.

Type 2 (Doncaster and Barnsley):

- All – Travel Plan, including an agreed mechanism for discouraging high emission vehicle use and encouraging modal shift (i.e. to public transport, cycling and walking), as well as uptake of low emission fuels and technologies.
- Improved pedestrian access to public transport
- New or improved bus stop infrastructure including shelters; raised kerbing; information displays.
- Provision of subsidised or free public transport ticketing
- Site layout designed to encourage walking; Cycle paths to link to local cycle network.
- improved, convenient and segregated cycle paths to link to local cycle network.

- Commercial Specific
  - All commercial vehicles should comply with current or the most recent European Emission Standards from scheme opening, to be progressively maintained for the lifetime of the development.

- Fleet operators should provide a strategy for reducing emissions, including the uptake of low emission fuels and technologies such as ultra-low emission service vehicles.
- Fleet operators should consider joining schemes such as the South Yorkshire ECO Stars scheme.

Type 3:

- Support measures to reduce the need to travel:
  - Alternative working practices - flexitime, teleworking, homeworking, videoconferencing, compressed work periods.
  - Local sourcing of staff, products and raw materials.
  - Development and use of hub distribution centres employing low emission deliveries.
  - Provision of discounted on-site shopping, eating, child-care, banking facilities.
- Support measures to reduce polluting motorised vehicle use:
  - Development of car clubs and car sharing with financial incentives and promotion.
  - Use of pooled low emission vehicles – cars, vans, taxis, bicycles.
  - Support smart driving training schemes.
  - Provision of dedicated low emission shuttle bus including managed pick-up and drop-off.
  - Contribution to the emerging low emission vehicle refuelling infrastructure.
  - Contribution to low emission waste collection services.
  - Incentives for the take-up of low emission vehicle technologies and fuels.
  - Sign-up to accepted Environmental Fleet Recognition Scheme.
- Measures to support improved public transport:
  - Provision of new or enhanced public transport services to the site.
  - Shuttle services to public transport interchange, rail station or park and ride facilities.
  - Support improving information systems for public transport.
  - Supporting free city bus expansion schemes.
  - Promoting low emission bus service provision.
  - Support air quality monitoring programmes.
- Further measures to promote walking and cycling:
  - Improvements to district walking and cycling networks including lighting, shelters, and information points and timetables.
  - Support cycle training and awareness schemes.
  - Bike/e-bike hiring schemes.

- Guaranteed ride home in emergencies.
- Support secure and safe cycle parking facilities.

— Measures to promote sustainable travel plans:
- Support local travel to school and school travel plans initiatives.
- Marketing aimed at persuading a switch to sustainable modes with incentives.
- Promotion of subsidised/sponsored travel plan measures through social and other media.
- Supporting community/local organisation groups to promote sustainable travel.

7.31. It is expected that a suitably worded prior to occupation condition can be secured against each plot, which will provide a mitigation strategy, detailing the specific mitigation measures proposed in line with local policy and guidance. A number of mitigation measures proposed for the development, and specifically each plot, have been included within the main ES Chapter. The implementation of such measures aims to reduce the emissions produced as a result of the operation of the proposed development and thus reduce the impacts on the impacted receptors.

SUMMARY

7.32. To summarise, the following mitigation measures are being proposed by the applicant specifically for the calculated damage cost for Hicketon, calculated at £176,370.15:

— Assign a proportion of the money to offer mechanical ventilation and filtration at the John O Gaunts residential property; and

— The remaining offsetting amount will be offered for air quality measures within Hickleton, which should be discussed with BMBC and CDC, and could include either a contribution towards an independent study (building on the initial emission study carried out by CDC) or a Highways Improvement Scheme, which will aid in reducing queuing and idling at the Hickleton Road and A635 junction, for example.

7.33. In addition to the above, Type 1, 2 and 3 mitigation measures for each plot will be provided as per the requirement of the BMBC (2021) Air Quality Technical Guidance, secured through a suitably worded planning condition.

8. CONCLUSIONS

INTRODUCTION

8.1. In line with the requirements of the application site allocation (*ES10 Land South of Dearne Valley Parkway)* requirements within the Barnsley Local Plan, a detailed AQA has been undertaken. Mitigation options have been discussed within this AQA to aid in compliance with Policy AQ1 *Development in Air Quality Management Areas* of the Barnsley Local Plan and Policy 54: *Pollution* of the Doncaster Local Plan.

8.2. A summary of the AQA is set out below.

BASELINE

8.3. The village of Hickleton is situated within an AQMA (AQMA No.7), declared for exceedances of the NO_2 annual mean and 1-hour mean objectives. The NO_2 monitoring locations within Hickleton, carried out in CDC, shows consistent non-compliance at a number of kerbside locations, with compliance noted at roadside locations, suggesting that the concentrations are dropping off with distance away from the A635.

CONSTRUCTION PHASE TRAFFIC IMPACTS

8.4. The AQA indicates that the impacts associated with the proposed development construction phase are anticipated to be '**significant**' at one dwelling (John O Gaunts) for NO_2, in line with the EPUK & IAQM (2017) guidance and professional judgement. It should be noted that the construction phase will be a temporary impact. This is due to the fact that this receptor is experiencing a 'significant' impact, with concentrations exceeding the NO_2 annual mean and 1-hour mean objective.

8.5. The annual mean PM_{10} and $PM_{2.5}$ concentration impacts at this receptor are considered '**not significant**.'

OPERATIONAL PHASE TRAFFIC IMPACTS

8.6. The AQA indicates that the impacts associated with the proposed development operational phase are anticipated to be '**significant**' at one dwelling (John O Gaunts) for NO_2, in line with the EPUK & IAQM (2017) guidance and professional judgement (pre-mitigation). This is due to the fact that this receptor is experiencing a 'significant' impact, with concentrations exceeding the NO_2 annual mean and 1-hour mean objective.

8.7. The annual mean PM_{10} and $PM_{2.5}$ concentration impacts at this receptor are considered '**not significant**.'

PROPOSED MITIGATION OPTIONS

8.8. A review of the impacts within Hickleton, and in line with the EPUK & IAQM (2017) guidance, the proposed air quality mitigation measures aim to both reduce and minimise exposure/impacts at one dwelling (John O Gaunts) by proposing a mechanical ventilation and filtration system. Any ventilation and filtration system is subject to agreement with the council. Based on the performance of this filtration mitigation, the post-mitigation impact is predicted to be 'not significant,' assuming that the filtration system is set up correctly, operated correctly and maintained correctly to ensure optimal efficiency. This is based on the fact that the concentrations within the John O Gants receptor is predicted to be with the relevant pollutant standards with this mitigation in place.

8.9. The impact of the development in Hickleton has been quantified as a damage cost, with the value set at £176,370.15. This overall cost determines the level of mitigation compensation required to negate the impact of the proposed development. Therefore, the proposed ventilation and filtration system, along with other mitigation measures to improve air quality within Hickleton, such as the contribution towards an independent study or proposed highways improvement scheme, should be offset against this cost.

8.10. In line with local guidance, additional mitigation measures will be provided, which will reduce emissions from the construction and operational phase of the proposed development. This is expected to be secured though a prior to occupation condition for each plot, as the occupiers are currently not known.

APPENDIX A – TRAFFIC DATA

Table A.1 - 2022 Baseline (Verification)

Link	Total Vehicles	HGV	HGV %
West of Hickleton Road / Red Hill Lane (eastbound)	9,796	1,274	13.0%
West of Hickleton Road / Red Hill Lane (westbound)	9,976	1,446	14.5%

Table A.2 - 2025 Baseline

Link	Total Vehicles	HGV	HGV %
West of Hickleton Road / Red Hill Lane (eastbound)	9,796	1,274	13.0%
West of Hickleton Road / Red Hill Lane (westbound)	9,976	1,446	14.5%

Table A.3 - 2025 Baseline + Construction Traffic

Link	Total Vehicles	HGV	HGV %
West of Hickleton Road / Red Hill Lane (eastbound)	9,892	1,317	13.3%
West of Hickleton Road / Red Hill Lane (westbound)	10,071	1,489	14.8%

Table A.4 - 2025 Baseline + Construction Traffic + Cumulative Traffic

Link	Total Vehicles	HGV	HGV %
West of Hickleton Road / Red Hill Lane (eastbound)	10,672	1,317	12.3%
West of Hickleton Road / Red Hill Lane (westbound)	10,838	1,489	13.7%

Table A.5 - 2026 Baseline

Link	Total Vehicles	HGV	HGV %
West of Hickleton Road / Red Hill Lane (eastbound)	9,857	1,281	13.0%
West of Hickleton Road / Red Hill Lane (westbound)	10,038	1,455	14.5%

Table A.6 - 2026 Baseline + Proposed Development

Link	Total Vehicles	HGV	HGV %
West of Hickleton Road / Red Hill Lane (eastbound)	10,497	1,691	16.1%
West of Hickleton Road / Red Hill Lane (westbound)	10,726	1,900	17.7%

Table A.7 - 2026 Baseline + Proposed Development + Cumulative Traffic

Link	Total Vehicles	HGV	HGV %
West of Hickleton Road / Red Hill Lane (eastbound)	11,277	1,691	15.0%
West of Hickleton Road / Red Hill Lane (westbound)	11,493	1,900	16.5%

Figure A. 1 - Traffic Count Points

Table A.8 – Surveyed A635 Road Speeds

Class	Vehicle	Average Mean Speed (mph)							
		Eastbound				Westbound			
		Site 1	Site 2	Site 3	Site 4	Site 1	Site 2	Site 3	Site 4
F1	Motorcycle	23.0	22.0	23.4	24.0	23.4	22.3	21.8	26.8
F2	Car or car-based LGV	24.7	25.7	24.1	23.9	25.5	25.9	25.7	26.6
F3	Light Goods Vehicles	25.1	26.4	24.4	23.6	25.8	26.1	25.9	26.5
F4	Buses	21.3	25.7	23.4	23.1	25.9	26.1	25.0	26.2
F5	Two Axle, Six Tyre, Rigid/Buses	25.7	27.4	23.4	23.6	26.2	26.2	25.2	25.8
F6	Three Axle Rigid	24.2	24.4	24.0	21.8	24.2	25.8	23.2	25.1
F7	Four or More Axle Rigid	21.9	21.7	23.3	15.3	22.5	22.4	21.2	26.6
F8	Four or Less Axle Artic	22.1	23.4	23.2	24.2	25.8	24.4	24.7	26.2

F9	Five Axle Artic	24.3	22.4	22.7	24.2	26.3	25.4	24.6	26.4
F10	Six or More Axle Artic	26.2	24.7	23.4	23.9	26.6	24.7	24.1	25.8
F11	Five or Less Axle Multi-Trailer Artic	25.9	24.9	22.9	24.1	26.4	24.6	24.4	26.1
F12	Six Axle Multi-Trailer Artic	23.7	27.9	22.6	N/A	22.9	20.4	25.7	25.0
F13	Seven or More Axle Artic	26.1	23.6	23.2	22.4	25.7	24.9	23.6	25.6
F1	Motorcycle	23.0	22.0	23.4	24.0	23.4	22.3	21.8	26.8
F2	Car or car-based LGV	24.7	25.7	24.1	23.9	25.5	25.9	25.7	26.6
Total		24.7	25.9	24.1	23.9	25.5	25.9	25.6	26.5

Figure A. 2 – Modelled Road Speeds - LDVs

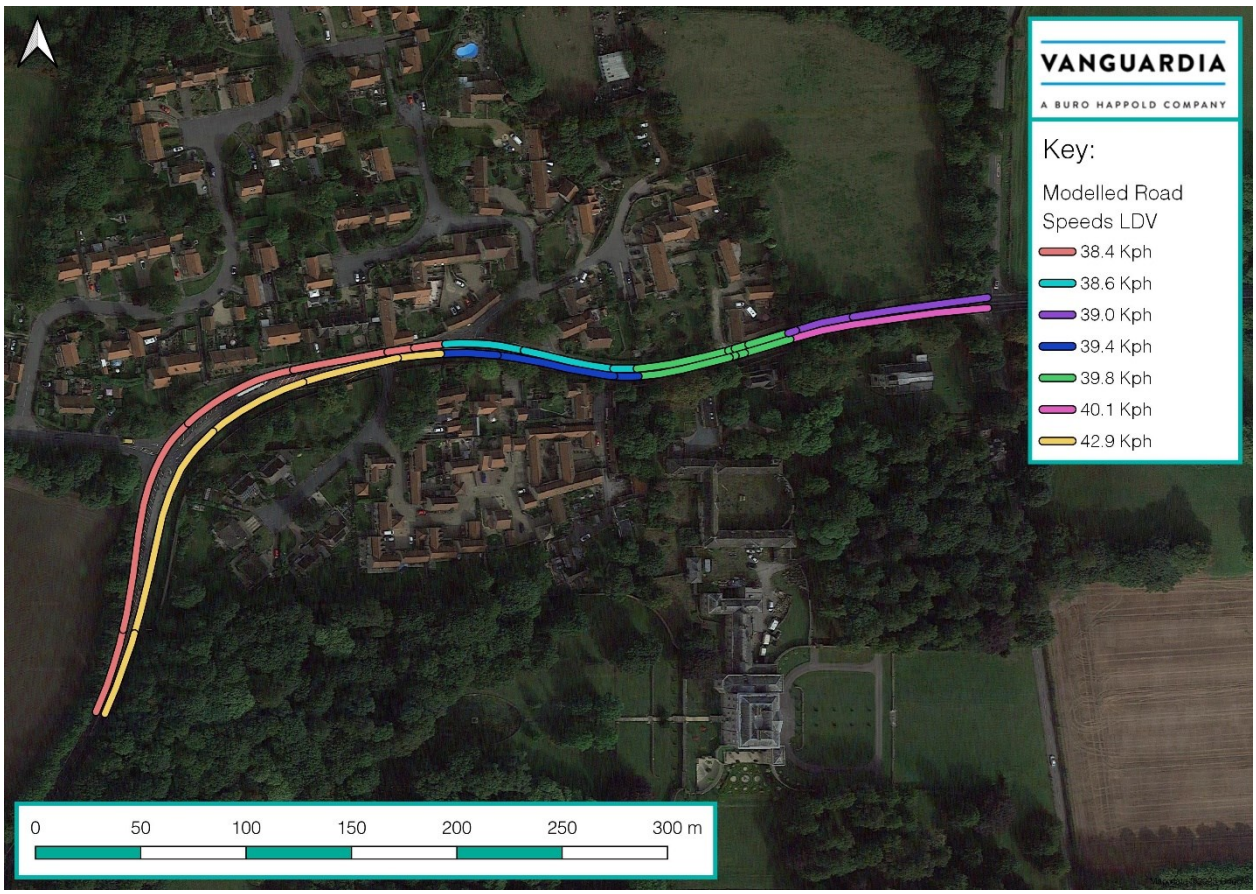
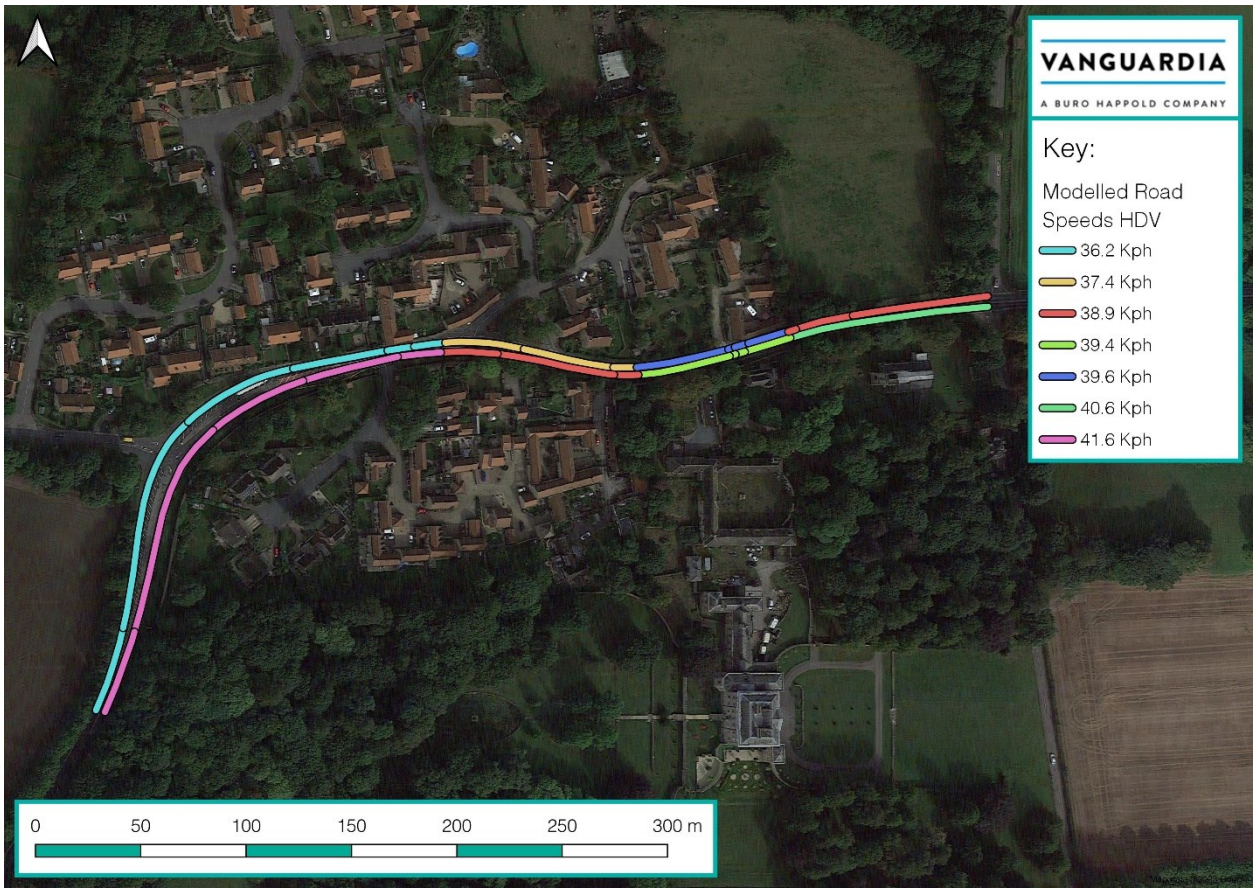


Figure A. 3 - Modelled Road Speeds - LDVs



APPENDIX B – RECEPTOR LOCATIONS

Table B.1 - Receptor Locations

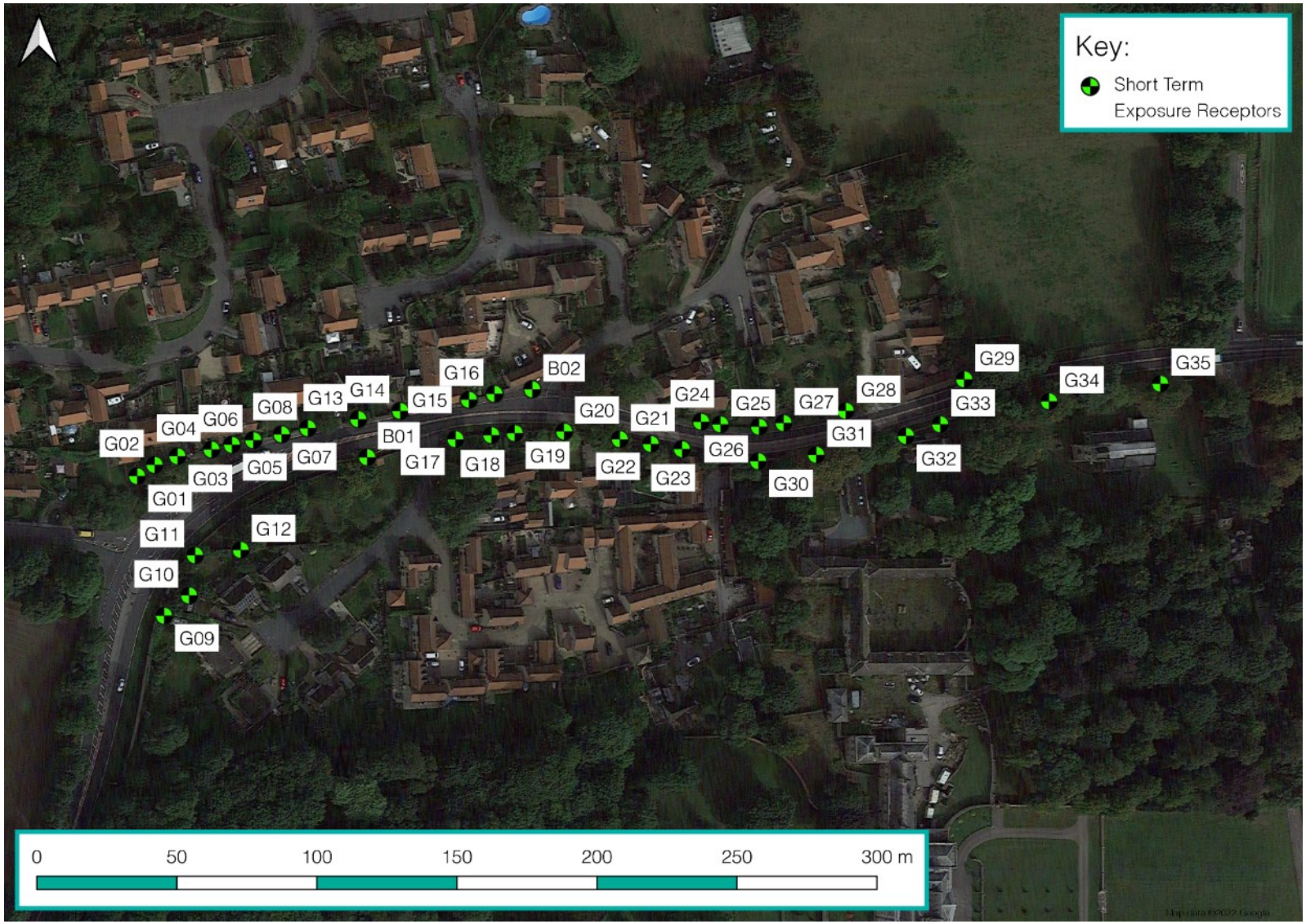
Receptors	Receptor Description	Grid Coordinates (m)			Site Classification
		X	Y	Z	
R01	84, HICKLETON, DONCASTER, DN5 7BG	447951	405297	1.5	Roadside
R02	82, HICKLETON, DONCASTER, DN5 7BG	447959	405303	1.5	Roadside
R03	78, HICKLETON, DONCASTER, DN5 7BG	447966	405304	1.5	Roadside
R04	33, HICKLETON, DONCASTER, DN5 7BG	447979	405306	1.5	Roadside
R05	32, HICKLETON, DONCASTER, DN5 7BG	447986	405307	1.5	Roadside
R06	30, HICKLETON, DONCASTER, DN5 7BG	447994	405308	1.5	Roadside
R07	66, HICKLETON, DONCASTER, DN5 7BG	448004	405316	1.5	Roadside
R08	60, HICKLETON, DONCASTER, DN5 7BG	448013	405318	1.5	Roadside
R09	29, HICKLETON, DONCASTER, DN5 7BG	448031	405321	1.5	Roadside
R10	26, HICKLETON, DONCASTER, DN5 7BG	448046	405323	1.5	Roadside
R11	6, THE MEWS, HICKLETON, DONCASTER, DN5 7BJ (Western Façade)	448057	405317	1.5	Roadside
R12	6, THE MEWS, HICKLETON, DONCASTER, DN5 7BJ (Eastern Façade)	448070	405321	1.5	Roadside
R13	2, FIR TREE CLOSE, HICKLETON, DONCASTER, DN5 7BD	447984	405250	1.5	Roadside
R14	2, FIR TREE CLOSE, HICKLETON, DONCASTER, DN5 7BD	447989	405254	1.5	Roadside
R15	1, FIR TREE CLOSE, HICKLETON, DONCASTER, DN5 7BD	447999	405258	1.5	Roadside
R16	1, FIR TREE CLOSE, HICKLETON, DONCASTER, DN5 7BD	448003	405262	1.5	Roadside
R17	12, HICKLETON, DONCASTER, DN5 7BA	448083	405296	1.5	Roadside
R18	12, HICKLETON, DONCASTER, DN5 7BA	448091	405297	1.5	Roadside
R19	10, HICKLETON, DONCASTER, DN5 7BA	448108	405294	1.5	Roadside
R20	HICKLETON VILLAGE SOCIAL CLUB, HICKLETON, DONCASTER, DN5 7BG	448138	405323	1.5	Roadside
R21	HICKLETON VILLAGE SOCIAL CLUB, HICKLETON, DONCASTER, DN5 7BG	448143	405321	1.5	Roadside
R22	19, HICKLETON, DONCASTER, DN5 7BG	448155	405315	1.5	Roadside
R23	19, HICKLETON, DONCASTER, DN5 7BG	448161	405315	1.5	Roadside
R24	9, HICKLETON, DONCASTER, DN5 7BA	448148	405299	0.3	Roadside
R25	9, HICKLETON, DONCASTER, DN5 7BA	448149	405299	3	Roadside
R26	9, HICKLETON, DONCASTER, DN5 7BA	448151	405299	0.3	Roadside
R27	JOHN O GAUNTS, HICKLETON, DONCASTER, DN5 7BG	448219	405324	1.5	Roadside

R28	JOHN O GAUNTS, HICKLETON, DONCASTER, DN5 7BG	448220	405321	1.5	Roadside
R29	JOHN O GAUNTS, HICKLETON, DONCASTER, DN5 7BG	448227	405319	1.5	Kerbside
R30	JOHN O GAUNTS, HICKLETON, DONCASTER, DN5 7BG	448231	405320	1.5	Kerbside
R31	JOHN O GAUNTS, HICKLETON, DONCASTER, DN5 7BG	448247	405326	1.5	Roadside
R32	THE TRACTOR SHED, HICKLETON HALL, HICKLETON, DONCASTER, DN5 7BA	448211	405298	1.5	Roadside
R33	THE VICARAGE, HICKLETON, DONCASTER, DN5 7BA	448230	405304	1.5	Roadside
R34	THE VICARAGE, HICKLETON, DONCASTER, DN5 7BA	448237	405305	1.5	Roadside
R35	ST WILFRID'S CHURCH	448308	405313	1.5	Roadside
B01	BUS SHELTER WEST OF FIR TREE CLOSE	448035	405299	1.5	Kerbside
B02	BUS SHELTER WEST OF CASTLE HILL	448094	405323	1.5	Kerbside
G01	GARDEN OF 84, HICKLETON, DONCASTER, DN5 7BG	447953	405292	1.5	Roadside
G02	GARDEN OF 82, HICKLETON, DONCASTER, DN5 7BG	447959	405296	1.5	Roadside
G03	GARDEN OF 76, HICKLETON, DONCASTER, DN5 7BG	447968	405299	1.5	Roadside
G04	GARDEN OF 33, HICKLETON, DONCASTER, DN5 7BG	447980	405301	1.5	Roadside
G05	GARDEN OF 31, HICKLETON, DONCASTER, DN5 7BG	447987	405303	1.5	Roadside
G06	GARDEN OF 30, HICKLETON, DONCASTER, DN5 7BG	447995	405305	1.5	Roadside
G07	GARDEN OF 66, HICKLETON, DONCASTER, DN5 7BG	448005	405307	1.5	Kerbside
G08	GARDEN OF 60, HICKLETON, DONCASTER, DN5 7BG	448014	405309	1.5	Kerbside
G09	GARDEN OF 3, FIR TREE CLOSE, HICKLETON, DONCASTER, DN5 7BD	447963	405242	1.5	Roadside
G10	GARDEN OF 2, FIR TREE CLOSE, HICKLETON, DONCASTER, DN5 7BD	447972	405249	1.5	Roadside
G11	GARDEN OF 2, FIR TREE CLOSE, HICKLETON, DONCASTER, DN5 7BD	447974	405264	1.5	Roadside
G12	GARDEN OF 1, FIR TREE CLOSE, HICKLETON, DONCASTER, DN5 7BD	447990	405266	1.5	Roadside
G13	GARDEN OF 66, HICKLETON, DONCASTER, DN5 7BG	448032	405312	1.5	Kerbside
G14	GARDEN OF 60, HICKLETON, DONCASTER, DN5 7BG	448047	405315	1.5	Kerbside
G15	GARDEN OF 6, THE MEWS, HICKLETON, DONCASTER, DN5 7BJ	448072	405319	1.5	Kerbside
G16	GARDEN OF 6, THE MEWS, HICKLETON, DONCASTER, DN5 7BJ	448081	405321	1.5	Kerbside

G17	GARDEN OF 12, HICKLETON, DONCASTER, DN5 7BA	448067	405305	1.5	Kerbside
G18	GARDEN OF 12, HICKLETON, DONCASTER, DN5 7BA	448080	405307	1.5	Kerbside
G19	GARDEN OF 12, HICKLETON, DONCASTER, DN5 7BA	448088	405307	1.5	Kerbside
G20	GARDEN OF 10, HICKLETON, DONCASTER, DN5 7BA	448106	405308	1.5	Kerbside
G21	GARDEN OF 9, HICKLETON, DONCASTER, DN5 7BA	448125	405305	1.5	Kerbside
G22	GARDEN OF 9, HICKLETON, DONCASTER, DN5 7BA	448137	405303	0.3	Kerbside
G23	GARDEN OF 9, HICKLETON, DONCASTER, DN5 7BA	448148	405302	0.3	Kerbside
G24	GARDEN OF 19, HICKLETON, DONCASTER, DN5 7BG	448154	405311	1.5	Kerbside
G25	GARDEN OF 19, HICKLETON, DONCASTER, DN5 7BG	448161	405310	1.5	Kerbside
G26	GARDEN OF 19, HICKLETON, DONCASTER, DN5 7BG	448175	405310	1.5	Kerbside
G27	GARDEN OF KIRKBRIDE BARN, HICKLETON, DONCASTER, DN5 7BG	448184	405311	1.5	Kerbside
G28	GARDEN OF KIRKBRIDE BARN, HICKLETON, DONCASTER, DN5 7BG	448206	405315	1.5	Kerbside
G29	GARDEN OF JOHN O GAUNTS, HICKLETON, DONCASTER, DN5 7BG	448248	405326	1.5	Kerbside
G30	GARDEN OF THE TRACTOR SHED, HICKLETON HALL, HICKLETON, DONCASTER, DN5 7BA	448175	405297	1.5	Kerbside
G31	GARDEN OF THE TRACTOR SHED, HICKLETON HALL, HICKLETON, DONCASTER, DN5 7BA	448196	405300	1.5	Kerbside
G32	GARDEN OF THE VICARAGE, HICKLETON, DONCASTER, DN5 7BA	448228	405306	1.5	Roadside
G33	GARDEN OF THE VICARAGE, HICKLETON, DONCASTER, DN5 7BA	448240	405310	1.5	Roadside
G34	ST WILFRID'S CHURCH	448279	405319	1.5	Roadside
G35	ST WILFRID'S CHURCH	448318	405325	1.5	Kerbside

Figure B.1 - Residential Receptor Locations

Figure B.2 Short-Term Exposure Receptor Locations



APPENDIX C – DONCASTER COUNCIL REAL WORLD DRIVING EMISSIONS STUDY

As per the consultation and meetings with Doncaster Council regarding the air quality issues within Hickleton, it came to light that an independent report was being carried out to further assess these issues, including establishing fleet composition based on Euro factors, which ultimately impact the emission of vehicles. This data was to then be used within this assessment to improve the accuracy of the model, rather than basing emission factors on national statistics, as the air quality issues within Hicketon are a very localised issue.

In order to improve the accuracy of the modelling, this assessment has used the Euro fleet composition provided in the Real World Driving Emissions study. The percentages of different vehicle categories were provided, which were then used within the Euro Composition advanced option in the EfT, and the user defined proportions for the assessment year were updated to be in line with the proportions set out in the Real World Driving Emissions study.

To note, a number of assumptions were made based on the limited datasets within the EfT and vehicle categorisation within the Real World Driving Emissions study, these include:

- The 'Coaches' classification in the Eft was used for 'Mini-bus'
- In the absence of any clarification regarding the 'Petrol/Electric' or 'Disel/Electric' categories, it has been assumed that all hybrid vehicles are 'Full Hybrid' rather than 'Plug in Hybrid.'
- In the absence of additional information, for Rigid HGV, Arctic HGVs, Buses, Coaches, it has been assumed that 100% of the Euro V proportions utilise EGR Technology.

The following percentage splits have been used within the EfT Euro Composition advanced option, which have ben based on the Real World Driving Emissions study :

Table C.1 NO_x Euro Split

Petrol Car	**User Euro Proportions England (not London)**
1Pre-Euro 1	-
2Euro 1	0.00
3Euro 2	0.01
4Euro 3	0.06
5Euro 4	0.19
6Euro 5	0.23
7Euro 6	0.52
8Euro 6c	-
Diesel Car	
1Pre-Euro 1	-

2Euro 1	-
3Euro 2	0.00
4Euro 3	0.04
5Euro 4	0.16
6Euro 5	0.37
7Euro 6	0.44
8Euro 6c	-
9Euro 6d	-
Petrol LGV	
1Pre-Euro 1	-
2Euro 1	-
3Euro 2	0.27
4Euro 3	0.09
5Euro 4	-
6Euro 5	-
7Euro 6	0.64
8Euro 6c	-
Diesel LGV	
1Pre-Euro 1	-
2Euro 1	0.00
3Euro 2	0.00
4Euro 3	0.04
5Euro 4	0.12
6Euro 5	0.30
7Euro 6	0.54
8Euro 6c	-
9Euro 6d	-
Rigid HGV	
1Pre-Euro I	-
2Euro I	-
3Euro II	0.01
4Euro III	0.03
5Euro IV	0.09
6Euro V_EGR	0.18
7Euro V_SCR	-
8Euro VI	0.69
9Euro II SCRRF	-
10Euro III SCRRF	-
11Euro IV SCRRF	-
12Euro V EGR + SCRRF	-
Artic HGV	
1Pre-Euro I	-
2Euro I	-
3Euro II	0.00
4Euro III	0.00
5Euro IV	0.01

6Euro V_EGR	0.10
7Euro V_SCR	-
8Euro VI	0.89
9Euro II SCRRF	-
10Euro III SCRRF	-
11Euro IV SCRRF	-
12Euro V EGR + SCRRF	-
Buses	
1Pre-Euro I	-
2Euro I	-
3Euro II	-
4Euro III	0.05
5Euro IV	0.09
6Euro V_EGR	0.81
7Euro V_SCR	-
8Euro VI	0.05
9Euro II SCRRF	-
10Euro III SCRRF	-
11Euro IV SCRRF	-
12Euro V EGR + SCRRF	-
Coaches	
1Pre-Euro I	-
2Euro I	-
3Euro II	-
4Euro III	-
5Euro IV	-
6Euro V_EGR	0.57
7Euro V_SCR	-
8Euro VI	0.43
9Euro II SCRRF	-
10Euro III SCRRF	-
11Euro IV SCRRF	-
12Euro V EGR + SCRRF	-
Full Hybrid Petrol Car	
4Euro 3	-
5Euro 4	0.01
6Euro 5	0.07
7Euro 6	0.92
8Euro 6c	-
Full Diesel Hybrid Car	
6Euro 5	-
7Euro 6	1.00
8Euro 6c	-
9Euro 6d	-
Battery EV Car	
All Sizes and Ages	1.00

Full Hybrid Petrol LGV	
5Euro 4	-
6Euro 5	-
7Euro 6	1.00
8Euro 6c	-

Table C.2 PM and CO Euro Split

Petrol Car	Default Euro Proportions England (not London)
1Pre-Euro 1	-
2Euro 1	0.00
3Euro 2	0.01
4Euro 3	0.06
5Euro 4	0.19
6Euro 5	0.23
7Euro 6	0.52
8Euro 6c	-
Diesel Car	
1Pre-Euro 1	-
2Euro 1	-
3Euro 2	0.00
4Euro 3	0.04
5Euro 4	0.16
6Euro 5	0.37
7Euro 6	0.44
8Euro 3 DPF	-
9Euro 4 DPF	-
Petrol LGV	
1Pre-Euro 1	-
2Euro 1	-
3Euro 2	0.27
4Euro 3	0.09
5Euro 4	-
6Euro 5	-
7Euro 6	0.64
8Euro 6c	-
Diesel LGV	
1Pre-Euro 1	-
2Euro 1	0.00
3Euro 2	0.00
4Euro 3	0.04
5Euro 4	0.12
6Euro 5	0.30
7Euro 6	0.54
8Euro 1 DPFRF	-

9Euro 2 DPFRF	-
10Euro 3 DPFRF	-
Rigid HGV	
1Pre-Euro I	-
2Euro I	-
3Euro II	0.01
4Euro III	0.03
5Euro IV	0.09
6Euro V_EGR	0.18
7Euro V_SCR	-
8Euro VI	0.69
9Euro I DPFRF	-
10 Euro II DPFRF	-
11 Euro III DPFRF	-
12 Euro IV DPFRF	-
Artic HGV	
1Pre-Euro I	-
2Euro I	-
3Euro II	0.00
4Euro III	0.00
5Euro IV	0.01
6Euro V_EGR	0.10
7Euro V_SCR	-
8Euro VI	0.89
9Euro I DPFRF	-
10 Euro II DPFRF	-
11 Euro III DPFRF	-
12 Euro IV DPFRF	-
Buses	
1Pre-Euro I	-
2Euro I	-
3Euro II	-
4Euro III	0.05
5Euro IV	0.09
6Euro V_EGR	0.81
7Euro V_SCR	-
8Euro VI	0.05
9Euro I DPFRF	-
10 Euro II DPFRF	-
11 Euro III DPFRF	-
12 Euro IV DPFRF	-
Coaches	
1Pre-Euro I	-
2Euro I	-
3Euro II	-
4Euro III	-

5Euro IV	-
6Euro V_EGR	0.57
7Euro V_SCR	-
8Euro VI	0.43
9Euro I DPFRF	-
10 Euro II DPFRF	-
11 Euro III DPFRF	-
12 Euro IV DPFRF	-
Full Hybrid Petrol Car	
4Euro 3	-
5Euro 4	0.01
6Euro 5	0.07
7Euro 6	0.92
8Euro 6c	-
Full Diesel Hybrid Car	
6Euro 5	-
7Euro 6	1.00
Battery EV	
All Sizes and Ages	1.00
Full Hybrid Petrol LGV	
5Euro 4	-
6Euro 5	-
7Euro 6	1.00
8Euro 6c	-

APPENDIX D – BASELINE CONCENTRATIONS

2025 Baseline

Table D 1 - 2025 Annual Mean Baseline Concentrations

Receptors	Annual Mean (µg/m³)		
	NO_2	PM_{10}	$PM_{2.5}$
Residential Receptors			
R01	17.1	16.8	9.9
R02	17.5	16.8	9.9
R03	18.6	16.9	10.0
R04	21.0	17.0	10.1
R05	22.6	17.1	10.1
R06	24.5	17.3	10.2
R07	21.4	18.0	10.3
R08	22.1	18.1	10.4
R09	22.7	18.1	10.4
R10	23.2	18.2	10.4
R11	29.8	18.6	11.9
R12	27.2	18.5	10.6
R13	16.3	16.8	9.9
R14	16.1	16.8	9.9
R15	15.6	16.7	9.9
R16	15.7	17.7	10.1
R17	17.6	17.8	10.2
R18	17.9	17.8	10.2
R19	17.0	17.8	10.2
R20	23.5	18.2	10.4
R21	23.9	18.2	10.5
R22	26.4	18.4	10.6
R23	25.3	18.3	10.5
R24	23.0	18.2	10.4
R25	17.7	17.8	10.2
R26	23.7	18.3	10.5
R27	23.3	18.2	10.4
R28	26.2	18.4	10.6
R29	**55.8**	24.1	14.1
R30	**51.3**	23.3	13.6
R31	28.0	18.5	10.6

R32	18.2	17.8	10.2
R33	18.7	17.9	10.2
R34	18.6	17.9	10.2
R35	16.9	17.8	10.2
Short-Term Exposure Receptors			
B01	27.0	19.4	11.2
B02	36.3	20.4	11.8
G01	18.5	16.9	10.0
G02	19.2	16.9	10.0
G03	20.6	17.0	10.1
G04	23.7	17.2	10.2
G05	25.6	17.3	10.3
G06	27.8	17.5	10.3
G07	37.5	20.5	11.9
G08	38.1	20.6	12.0
G09	20.2	17.1	10.1
G10	18.3	16.9	10.0
G11	20.7	17.1	10.1
G12	17.3	16.8	9.9
G13	39.8	20.9	12.1
G14	39.6	20.9	12.1
G15	37.8	20.7	12.0
G16	37.5	20.6	11.9
G17	27.3	19.4	11.2
G18	26.8	19.3	11.2
G19	26.9	19.4	11.2
G20	28.0	19.5	11.3
G21	27.9	19.5	11.3
G22	32.0	20.1	11.6
G23	33.0	20.2	11.7
G24	38.5	20.8	12.0
G25	37.9	20.7	12.0
G26	39.0	20.8	12.1
G27	38.4	20.8	12.1
G28	37.7	20.7	12.0
G29	34.2	20.2	11.7
G30	25.9	19.2	11.1
G31	35.7	21.0	12.1

G32	20.1	18.0	10.3
G33	21.0	18.1	10.3
G34	21.8	18.1	10.4
G35	21.6	18.0	10.3
Objectives / Limit - Long Term	**40**	**40**	**20**
Objectives / Limit - Short Term	**60**	**50**	**-**

Notes:
Bold indicates an exceedance of the annual mean objective (where applicable to receptor type).
Bold and underlined indicates an exceedance of the NO_2 1-hour mean objective.

2026 BASELINE

Table D 2 - 2026 Annual Mean Baseline Concentrations

Receptors	Annual Mean (µg/m^3)		
	NO_2	**PM_{10}**	**$PM_{2.5}$**
Residential Receptors			
R01	16.9	16.8	9.9
R02	17.2	16.8	9.9
R03	18.3	16.9	10.0
R04	20.8	17.0	10.1
R05	22.3	17.1	10.1
R06	24.2	17.2	10.2
R07	21.1	18.0	10.3
R08	21.8	18.1	10.4
R09	22.4	18.1	10.4
R10	22.9	18.2	10.4
R11	29.4	18.6	10.7
R12	26.9	18.4	10.6
R13	16.0	16.8	9.9
R14	15.8	16.7	9.9
R15	15.4	16.7	9.9
R16	15.5	17.7	10.1
R17	17.3	17.8	10.2
R18	17.6	17.8	10.2
R19	16.7	17.8	10.2
R20	23.2	18.2	10.4
R21	23.6	18.2	10.4
R22	26.1	18.4	10.6
R23	25.0	18.3	10.5

R24	22.7	18.2	10.4
R25	17.5	17.8	10.2
R26	23.4	18.3	10.5
R27	23.0	18.2	10.4
R28	25.8	18.4	10.6
R29	**55.1**	24.2	14.1
R30	**50.7**	23.3	13.6
R31	27.6	18.5	10.6
R32	17.9	17.8	10.2
R33	18.4	17.9	10.2
R34	18.3	17.9	10.2
R35	16.6	17.7	10.1
Short-Term Exposure Receptors			
B01	26.6	19.4	11.2
B02	35.9	20.4	11.8
G01	18.3	16.9	10.0
G02	18.9	16.9	10.0
G03	20.3	17.0	10.0
G04	23.4	17.2	10.2
G05	25.3	17.3	10.2
G06	27.5	17.5	10.3
G07	37.1	20.5	11.9
G08	37.7	20.6	12.0
G09	20.0	17.1	10.1
G10	18.0	16.9	10.0
G11	20.4	17.1	10.1
G12	17.1	16.8	9.9
G13	39.4	20.9	12.1
G14	39.1	20.9	12.1
G15	37.3	20.7	12.0
G16	37.1	20.6	11.9
G17	27.0	19.4	11.2
G18	26.4	19.3	11.1
G19	26.5	19.4	11.2
G20	27.6	19.5	11.2
G21	27.5	19.5	11.2
G22	31.6	20.1	11.6
G23	32.5	20.2	11.7

G24	38.1	20.7	12.0
G25	37.5	20.7	12.0
G26	38.5	20.8	12.1
G27	37.9	20.8	12.1
G28	37.3	20.7	12.0
G29	33.8	20.2	11.7
G30	25.6	19.2	11.1
G31	35.2	21.0	12.1
G32	19.8	18.0	10.3
G33	20.7	18.0	10.3
G34	21.5	18.0	10.3
G35	21.3	18.0	10.3
Objectives / Limit - Long Term	**40**	**40**	**20**
Objectives / Limit - Short Term	**60**	**50**	**-**

Notes:
Bold indicates an exceedance of the annual mean objective (where applicable to receptor type).
Bold and underlined indicates an exceedance of the NO_2 1-hour mean objective.

APPENDIX E – CONSTRUCTION PHASE IMPACT CONCENTRATIONS – WITHOUT CUMULATIVE TRAFFIC

2025 Baseline + Construction Traffic (Without Cumulative Impacts)

Table E. 1 - 2025 Construction Impacts on NO_2 Annual Mean Concentrations

Receptors	2025 Baseline (µg/m^3)	2025 Baseline + Construction Traffic (µg/m^3)	Concentration Increase (µg/m^3)	Change of Objective %	Impact Descriptor
Residential Receptors					
R01	17.1	17.2	0.11	0%	Negligible
R02	17.5	17.6	0.13	0%	Negligible
R03	18.6	18.7	0.14	0%	Negligible
R04	21.0	21.2	0.20	0%	Negligible
R05	22.6	22.8	0.23	1%	Negligible
R06	24.5	24.8	0.26	1%	Negligible
R07	21.4	21.6	0.20	0%	Negligible
R08	22.1	22.3	0.21	1%	Negligible
R09	22.7	22.9	0.21	1%	Negligible
R10	23.2	23.4	0.22	1%	Negligible
R11	29.8	30.1	0.33	1%	Negligible
R12	27.2	27.5	0.29	1%	Negligible
R13	16.3	16.4	0.09	0%	Negligible
R14	16.1	16.2	0.09	0%	Negligible
R15	15.6	15.7	0.08	0%	Negligible
R16	15.7	15.8	0.08	0%	Negligible
R17	17.6	17.7	0.12	0%	Negligible
R18	17.9	18.0	0.12	0%	Negligible
R19	17.0	17.1	0.11	0%	Negligible
R20	23.5	23.8	0.23	1%	Negligible
R21	23.9	24.1	0.24	1%	Negligible
R22	26.4	26.7	0.27	1%	Negligible
R23	25.3	25.5	0.26	1%	Negligible
R24	23.0	23.2	0.21	1%	Negligible
R25	17.7	17.9	0.12	0%	Negligible
R26	23.7	24.0	0.22	1%	Negligible
R27	23.3	23.5	0.21	1%	Negligible
R28	26.2	26.4	0.25	1%	Negligible

Receptors	2025 Baseline (µg/m³)	2025 Baseline + Construction Traffic (µg/m³)	Concentration Increase (µg/m³)	Change of Objective %	Impact Descriptor
R29	55.8	56.4	0.57	1%	Moderate
R30	51.3	51.8	0.52	1%	Moderate
R31	28.0	28.2	0.27	1%	Negligible
R32	18.2	18.4	0.13	0%	Negligible
R33	18.7	18.8	0.13	0%	Negligible
R34	18.6	18.8	0.13	0%	Negligible
R35	16.9	17.0	0.10	0%	Negligible
Short-Term Exposure Receptors					
B01	27.0	27.2	0.26		
B02	36.3	36.8	0.45		
G01	18.5	18.7	0.14		
G02	19.2	19.4	0.15		
G03	20.6	20.8	0.18		
G04	23.7	23.9	0.24		
G05	25.6	25.9	0.27		
G06	27.8	28.2	0.32		
G07	37.5	37.9	0.48		
G08	38.1	38.6	0.48		
G09	20.2	20.4	0.16		
G10	18.3	18.4	0.13		
G11	20.7	20.9	0.16		
G12	17.3	17.4	0.11		
G13	39.8	40.3	0.50		
G14	39.6	40.0	0.49		
G15	37.8	38.2	0.46		
G16	37.5	38.0	0.46		
G17	27.3	27.6	0.28		
G18	26.8	27.1	0.27		
G19	26.9	27.2	0.27		
G20	28.0	28.3	0.28		
G21	27.9	28.2	0.28		
G22	32.0	32.4	0.34		
G23	33.0	33.3	0.35		
G24	38.5	39.0	0.47		
G25	37.9	38.4	0.46		

Receptors	2025 Baseline (µg/m³)	2025 Baseline + Construction Traffic (µg/m³)	Concentration Increase (µg/m³)	Change of Objective %	Impact Descriptor
G26	39.0	39.5	0.48		
G27	38.4	38.8	0.47		
G28	37.7	38.2	0.46		
G29	34.2	34.5	0.36		
G30	25.9	26.2	0.26		
G31	35.7	36.0	0.35		
G32	20.1	20.3	0.16		
G33	21.0	21.2	0.16		
G34	21.8	22.0	0.18		
G35	21.6	21.7	0.18		

Notes:
Bold indicates an exceedance of the annual mean objective (where applicable to receptor type).
Bold and underlined indicates an exceedance of the NO_2 1-hour mean objective.

Table E. 2 - 2025 Construction Impacts on PM_{10} Annual Mean Concentrations

Receptors	2025 Baseline (µg/m³)	2025 Baseline + Construction Traffic (µg/m³)	Concentration Increase (µg/m³)	Change of Objective %	Impact Descriptor
Residential Receptors					
R01	16.8	16.8	0.01	0%	Negligible
R02	16.8	16.8	0.01	0%	Negligible
R03	16.9	16.9	0.01	0%	Negligible
R04	17.0	17.1	0.01	0%	Negligible
R05	17.1	17.2	0.01	0%	Negligible
R06	17.3	17.3	0.01	0%	Negligible
R07	18.0	18.1	0.01	0%	Negligible
R08	18.1	18.1	0.01	0%	Negligible
R09	18.1	18.1	0.01	0%	Negligible
R10	18.2	18.2	0.01	0%	Negligible
R11	18.6	18.7	0.02	0%	Negligible
R12	18.5	18.5	0.02	0%	Negligible
R13	16.8	16.8	0.01	0%	Negligible
R14	16.8	16.8	0.01	0%	Negligible
R15	16.7	16.7	0.01	0%	Negligible
R16	17.7	17.7	0.01	0%	Negligible
R17	17.8	17.8	0.01	0%	Negligible
R18	17.8	17.8	0.01	0%	Negligible
R19	17.8	17.8	0.01	0%	Negligible

Receptors	2025 Baseline (µg/m³)	2025 Baseline + Construction Traffic (µg/m³)	Concentration Increase (µg/m³)	Change of Objective %	Impact Descriptor
R20	18.2	18.2	0.01	0%	Negligible
R21	18.2	18.2	0.01	0%	Negligible
R22	18.4	18.4	0.02	0%	Negligible
R23	18.3	18.3	0.02	0%	Negligible
R24	18.2	18.2	0.01	0%	Negligible
R25	17.8	17.8	0.01	0%	Negligible
R26	18.3	18.3	0.01	0%	Negligible
R27	18.2	18.2	0.01	0%	Negligible
R28	18.4	18.4	0.02	0%	Negligible
R29	24.1	24.2	0.11	0%	Negligible
R30	23.3	23.4	0.10	0%	Negligible
R31	18.5	18.5	0.02	0%	Negligible
R32	17.8	17.9	0.01	0%	Negligible
R33	17.9	17.9	0.01	0%	Negligible
R34	17.9	17.9	0.01	0%	Negligible
R35	17.8	17.8	0.01	0%	Negligible
Short-Term Exposure Receptors					
B01	19.4	19.4	0.04		
B02	20.4	20.5	0.05		
G01	16.9	16.9	0.01		
G02	16.9	16.9	0.01		
G03	17.0	17.0	0.01		
G04	17.2	17.2	0.01		
G05	17.3	17.3	0.02		
G06	17.5	17.5	0.02		
G07	20.5	20.5	0.05		
G08	20.6	20.7	0.06		
G09	17.1	17.1	0.01		
G10	16.9	16.9	0.01		
G11	17.1	17.1	0.01		
G12	16.8	16.9	0.01		
G13	20.9	20.9	0.06		
G14	20.9	20.9	0.06		
G15	20.7	20.7	0.06		
G16	20.6	20.6	0.06		

Receptors	2025 Baseline (µg/m³)	2025 Baseline + Construction Traffic (µg/m³)	Concentration Increase (µg/m³)	Change of Objective %	Impact Descriptor
G17	19.4	19.4	0.04		
G18	19.3	19.4	0.03		
G19	19.4	19.4	0.03		
G20	19.5	19.6	0.04		
G21	19.5	19.5	0.04		
G22	20.1	20.2	0.04		
G23	20.2	20.3	0.05		
G24	20.8	20.8	0.06		
G25	20.7	20.7	0.06		
G26	20.8	20.9	0.06		
G27	20.8	20.9	0.06		
G28	20.7	20.8	0.06		
G29	20.2	20.3	0.05		
G30	19.2	19.3	0.03		
G31	21.0	21.0	0.06		
G32	18.0	18.0	0.01		
G33	18.1	18.1	0.01		
G34	18.1	18.1	0.01		
G35	18.0	18.1	0.01		

Notes:
Bold indicates an exceedance of the annual mean objective.

Table E. 3- 2025 Construction Impacts on $PM_{2.5}$ Annual Mean Concentrations

Receptors	2025 Baseline (µg/m³)	2025 Baseline + Construction Traffic (µg/m³)	Concentration Increase (µg/m³)	Change of Objective %	Impact Descriptor
		Residential Receptors			
R01	9.9	9.9	0.00	0%	Negligible
R02	9.9	9.9	0.00	0%	Negligible
R03	10.0	10.0	0.00	0%	Negligible
R04	10.1	10.1	0.01	0%	Negligible
R05	10.1	10.1	0.01	0%	Negligible
R06	10.2	10.2	0.01	0%	Negligible
R07	10.3	10.4	0.01	0%	Negligible
R08	10.4	10.4	0.01	0%	Negligible
R09	10.4	10.4	0.01	0%	Negligible
R10	10.4	10.4	0.01	0%	Negligible

Receptors	2025 Baseline (µg/m³)	2025 Baseline + Construction Traffic (µg/m³)	Concentration Increase (µg/m³)	Change of Objective %	Impact Descriptor
R11	11.9	12.0	0.03	0%	Negligible
R12	10.6	10.6	0.01	0%	Negligible
R13	9.9	9.9	0.00	0%	Negligible
R14	9.9	9.9	0.00	0%	Negligible
R15	9.9	9.9	0.00	0%	Negligible
R16	10.1	10.1	0.00	0%	Negligible
R17	10.2	10.2	0.00	0%	Negligible
R18	10.2	10.2	0.00	0%	Negligible
R19	10.2	10.2	0.00	0%	Negligible
R20	10.4	10.4	0.01	0%	Negligible
R21	10.5	10.5	0.01	0%	Negligible
R22	10.6	10.6	0.01	0%	Negligible
R23	10.5	10.5	0.01	0%	Negligible
R24	10.4	10.5	0.01	0%	Negligible
R25	10.2	10.2	0.00	0%	Negligible
R26	10.5	10.5	0.01	0%	Negligible
R27	10.4	10.5	0.01	0%	Negligible
R28	10.6	10.6	0.01	0%	Negligible
R29	14.1	14.2	0.07	0%	Negligible
R30	13.6	13.6	0.06	0%	Negligible
R31	10.6	10.7	0.01	0%	Negligible
R32	10.2	10.2	0.01	0%	Negligible
R33	10.2	10.2	0.01	0%	Negligible
R34	10.2	10.2	0.01	0%	Negligible
R35	10.2	10.2	0.00	0%	Negligible
Short-Term Exposure Receptors					
B01	11.2	11.2	0.02		
B02	11.8	11.9	0.04		
G01	10.0	10.0	0.01		
G02	10.0	10.0	0.01		
G03	10.1	10.1	0.01		
G04	10.2	10.2	0.01		
G05	10.3	10.3	0.01		
G06	10.3	10.4	0.01		
G07	11.9	11.9	0.03		

Receptors	2025 Baseline (µg/m^3)	2025 Baseline + Construction Traffic (µg/m^3)	Concentration Increase (µg/m^3)	Change of Objective %	Impact Descriptor
G08	12.0	12.0	0.03		
G09	10.1	10.1	0.01		
G10	10.0	10.0	0.00		
G11	10.1	10.1	0.01		
G12	9.9	10.0	0.00		
G13	12.1	12.2	0.04		
G14	12.1	12.2	0.04		
G15	12.0	12.0	0.04		
G16	11.9	12.0	0.04		
G17	11.2	11.2	0.02		
G18	11.2	11.2	0.02		
G19	11.2	11.2	0.02		
G20	11.3	11.3	0.02		
G21	11.3	11.3	0.02		
G22	11.6	11.6	0.03		
G23	11.7	11.7	0.03		
G24	12.0	12.1	0.04		
G25	12.0	12.0	0.04		
G26	12.1	12.1	0.04		
G27	12.1	12.1	0.04		
G28	12.0	12.1	0.04		
G29	11.7	11.8	0.03		
G30	11.1	11.1	0.02		
G31	12.1	12.2	0.03		
G32	10.3	10.3	0.01		
G33	10.3	10.4	0.01		
G34	10.4	10.4	0.01		
G35	10.3	10.4	0.01		

Notes:
Bold indicates an exceedance of the annual mean objective.

APPENDIX F – CONSTRUCTION PHASE IMPACT CONCENTRATIONS – WITH CUMULATIVE TRAFFIC

2025 Baseline + Construction Traffic (With Cumulative Traffic)

Table F. 1 - 2025 Construction Impacts on NO_2 Annual Mean Concentrations

Receptors	2025 Baseline (µg/m^3)	2025 Baseline + Construction Traffic + Cumulative Traffic (µg/m^3)	Concentration Increase (µg/m^3)	Change of Objective %	Impact Descriptor
Residential Receptors					
R01	17.1	17.5	0.40	1%	Negligible
R02	17.5	17.9	0.42	1%	Negligible
R03	18.6	19.1	0.48	1%	Negligible
R04	21.0	21.7	0.63	2-5%	Negligible
R05	22.6	23.3	0.72	2-5%	Negligible
R06	24.5	25.4	0.83	2-5%	Negligible
R07	21.4	22.1	0.66	2-5%	Negligible
R08	22.1	22.8	0.69	2-5%	Negligible
R09	22.7	23.4	0.72	2-5%	Negligible
R10	23.2	24.0	0.76	2-5%	Negligible
R11	29.8	30.9	1.13	2-5%	Slight
R12	27.2	28.2	1.00	2-5%	Negligible
R13	16.3	16.6	0.35	1%	Negligible
R14	16.1	16.4	0.34	1%	Negligible
R15	15.6	16.0	0.32	1%	Negligible
R16	15.7	16.1	0.32	1%	Negligible
R17	17.6	18.0	0.43	1%	Negligible
R18	17.9	18.3	0.45	1%	Negligible
R19	17.0	17.4	0.39	1%	Negligible
R20	23.5	24.3	0.78	2-5%	Negligible
R21	23.9	24.7	0.80	2-5%	Negligible
R22	26.4	27.3	0.94	2-5%	Negligible
R23	25.3	26.2	0.88	2-5%	Negligible
R24	23.0	23.8	0.78	2-5%	Negligible
R25	17.7	18.2	0.43	1%	Negligible
R26	23.7	24.6	0.82	2-5%	Negligible
R27	23.3	24.1	0.78	2-5%	Negligible

Receptors	2025 Baseline (µg/m³)	2025 Baseline + Construction Traffic + Cumulative Traffic (µg/m³)	Concentration Increase (µg/m³)	Change of Objective %	Impact Descriptor
R28	26.2	27.1	0.94	2-5%	Negligible
R29	55.8	58.4	2.56	6-10%	Substantial
R30	51.3	53.6	2.33	6-10%	Substantial
R31	28.0	29.0	1.02	2-5%	Negligible
R32	18.2	18.7	0.46	1%	Negligible
R33	18.7	19.2	0.50	1%	Negligible
R34	18.6	19.1	0.49	1%	Negligible
R35	16.9	17.3	0.37	1%	Negligible
Short-Term Exposure Receptors					
B01	27.0	28.0	1.02		
B02	36.3	37.8	1.46		
G01	18.5	19.0	0.49		
G02	19.2	19.7	0.52		
G03	20.6	21.2	0.60		
G04	23.7	24.5	0.78		
G05	25.6	26.5	0.88		
G06	27.8	28.9	1.01		
G07	37.5	39.0	1.49		
G08	38.1	39.7	1.53		
G09	20.2	20.9	0.63		
G10	18.3	18.8	0.50		
G11	20.7	21.4	0.65		
G12	17.3	17.8	0.43		
G13	39.8	41.4	1.63		
G14	39.6	41.2	1.62		
G15	37.8	39.3	1.55		
G16	37.5	39.1	1.52		
G17	27.3	28.4	1.04		
G18	26.8	27.8	1.00		
G19	26.9	27.9	1.01		
G20	28.0	29.1	1.08		
G21	27.9	28.9	1.06		
G22	32.0	33.3	1.30		
G23	33.0	34.3	1.35		
G24	38.5	40.1	1.57		

Receptors	2025 Baseline (µg/m³)	2025 Baseline + Construction Traffic + Cumulative Traffic (µg/m³)	Concentration Increase (µg/m³)	Change of Objective %	Impact Descriptor
G25	37.9	39.5	1.55		
G26	39.0	40.6	1.60		
G27	38.4	40.0	1.59		
G28	37.7	39.3	1.56		
G29	34.2	35.5	1.35		
G30	25.9	26.9	0.95		
G31	35.7	37.2	1.58		
G32	20.1	20.7	0.59		
G33	21.0	21.6	0.64		
G34	21.8	22.5	0.65		
G35	21.6	22.2	0.63		

Notes:
Bold indicates an exceedance of the annual mean objective (where applicable to receptor type).
Bold and underlined indicates an exceedance of the NO_2 1-hour mean objective.

Table F. 2 - 2025 Construction Impacts on PM_{10} Annual Mean Concentrations

Receptors	2025 Baseline (µg/m³)	2025 Baseline + Construction Traffic + Cumulative Traffic (µg/m³)	Concentration Increase (µg/m³)	Change of Objective %	Impact Descriptor
Residential Receptors					
R01	16.8	16.8	0.03	0%	Negligible
R02	16.8	16.9	0.03	0%	Negligible
R03	16.9	16.9	0.03	0%	Negligible
R04	17.0	17.1	0.05	0%	Negligible
R05	17.1	17.2	0.05	0%	Negligible
R06	17.3	17.3	0.06	0%	Negligible
R07	18.0	18.1	0.05	0%	Negligible
R08	18.1	18.1	0.05	0%	Negligible
R09	18.1	18.2	0.05	0%	Negligible
R10	18.2	18.2	0.06	0%	Negligible
R11	18.6	18.7	0.09	0%	Negligible
R12	18.5	18.5	0.08	0%	Negligible
R13	16.8	16.8	0.03	0%	Negligible
R14	16.8	16.8	0.02	0%	Negligible
R15	16.7	16.7	0.02	0%	Negligible
R16	17.7	17.7	0.02	0%	Negligible
R17	17.8	17.8	0.03	0%	Negligible

Receptors	2025 Baseline (µg/m^3)	2025 Baseline + Construction Traffic + Cumulative Traffic (µg/m^3)	Concentration Increase (µg/m^3)	Change of Objective %	Impact Descriptor
R18	17.8	17.9	0.03	0%	Negligible
R19	17.8	17.8	0.03	0%	Negligible
R20	18.2	18.3	0.06	0%	Negligible
R21	18.2	18.3	0.06	0%	Negligible
R22	18.4	18.5	0.07	0%	Negligible
R23	18.3	18.4	0.07	0%	Negligible
R24	18.2	18.3	0.06	0%	Negligible
R25	17.8	17.9	0.03	0%	Negligible
R26	18.3	18.3	0.06	0%	Negligible
R27	18.2	18.3	0.06	0%	Negligible
R28	18.4	18.5	0.07	0%	Negligible
R29	24.1	24.6	0.49	1%	Negligible
R30	23.3	23.7	0.42	1%	Negligible
R31	18.5	18.6	0.08	0%	Negligible
R32	17.8	17.9	0.03	0%	Negligible
R33	17.9	17.9	0.04	0%	Negligible
R34	17.9	17.9	0.04	0%	Negligible
R35	17.8	17.8	0.03	0%	Negligible
Short-Term Exposure Receptors					
B01	19.4	19.6	0.14		
B02	20.4	20.6	0.22		
G01	16.9	16.9	0.04		
G02	16.9	17.0	0.04		
G03	17.0	17.1	0.04		
G04	17.2	17.3	0.06		
G05	17.3	17.4	0.07		
G06	17.5	17.5	0.08		
G07	20.5	20.7	0.22		
G08	20.6	20.8	0.23		
G09	17.1	17.1	0.05		
G10	16.9	17.0	0.04		
G11	17.1	17.2	0.05		
G12	16.8	16.9	0.03		
G13	20.9	21.1	0.25		
G14	20.9	21.1	0.25		

Receptors	2025 Baseline (µg/m³)	2025 Baseline + Construction Traffic + Cumulative Traffic (µg/m³)	Concentration Increase (µg/m³)	Change of Objective %	Impact Descriptor
G15	20.7	20.9	0.23		
G16	20.6	20.8	0.23		
G17	19.4	19.6	0.14		
G18	19.3	19.5	0.14		
G19	19.4	19.5	0.14		
G20	19.5	19.7	0.15		
G21	19.5	19.7	0.15		
G22	20.1	20.3	0.19		
G23	20.2	20.4	0.20		
G24	20.8	21.0	0.24		
G25	20.7	20.9	0.23		
G26	20.8	21.1	0.24		
G27	20.8	21.0	0.24		
G28	20.7	21.0	0.24		
G29	20.2	20.4	0.20		
G30	19.2	19.4	0.13		
G31	21.0	21.2	0.25		
G32	18.0	18.0	0.04		
G33	18.1	18.1	0.05		
G34	18.1	18.1	0.05		
G35	18.0	18.1	0.05		

Notes:
Bold indicates an exceedance of the annual mean objective.

Table F. 3- 2025 Construction Impacts on $PM_{2.5}$ Annual Mean Concentrations

Receptors	2025 Baseline (µg/m³)	2025 Baseline + Construction Traffic + Cumulative Traffic (µg/m³)	Concentration Increase (µg/m³)	Change of Objective %	Impact Descriptor
Residential Receptors					
R01	9.9	9.9	0.02	0%	Negligible
R02	9.9	10.0	0.02	0%	Negligible
R03	10.0	10.0	0.02	0%	Negligible
R04	10.1	10.1	0.03	0%	Negligible
R05	10.1	10.2	0.03	0%	Negligible
R06	10.2	10.3	0.04	0%	Negligible
R07	10.3	10.4	0.03	0%	Negligible

Receptors	2025 Baseline (µg/m^3)	2025 Baseline + Construction Traffic + Cumulative Traffic (µg/m^3)	Concentration Increase (µg/m^3)	Change of Objective %	Impact Descriptor
R08	10.4	10.4	0.03	0%	Negligible
R09	10.4	10.4	0.03	0%	Negligible
R10	10.4	10.5	0.03	0%	Negligible
R11	10.7	10.8	0.06	0%	Negligible
R12	10.6	10.7	0.05	0%	Negligible
R13	9.9	9.9	0.02	0%	Negligible
R14	9.9	9.9	0.02	0%	Negligible
R15	9.9	9.9	0.01	0%	Negligible
R16	10.1	10.1	0.01	0%	Negligible
R17	10.2	10.2	0.02	0%	Negligible
R18	10.2	10.2	0.02	0%	Negligible
R19	10.2	10.2	0.02	0%	Negligible
R20	10.4	10.5	0.04	0%	Negligible
R21	10.5	10.5	0.04	0%	Negligible
R22	10.6	10.6	0.04	0%	Negligible
R23	10.5	10.6	0.04	0%	Negligible
R24	10.4	10.5	0.04	0%	Negligible
R25	10.2	10.2	0.02	0%	Negligible
R26	10.5	10.5	0.04	0%	Negligible
R27	10.4	10.5	0.04	0%	Negligible
R28	10.6	10.6	0.05	0%	Negligible
R29	14.1	14.4	0.30	2-5%	Negligible
R30	13.6	13.9	0.26	1%	Negligible
R31	10.6	10.7	0.05	0%	Negligible
R32	10.2	10.2	0.02	0%	Negligible
R33	10.2	10.3	0.02	0%	Negligible
R34	10.2	10.3	0.02	0%	Negligible
R35	10.2	10.2	0.02	0%	Negligible
Short-Term Exposure Receptors					
B01	11.2	11.3	0.09		
B02	11.8	12.0	0.13		
G01	10.0	10.0	0.02		
G02	10.0	10.0	0.02		
G03	10.1	10.1	0.03		
G04	10.2	10.2	0.04		

Receptors	2025 Baseline (µg/m^3)	2025 Baseline + Construction Traffic + Cumulative Traffic (µg/m^3)	Concentration Increase (µg/m^3)	Change of Objective %	Impact Descriptor
G05	10.3	10.3	0.04		
G06	10.3	10.4	0.05		
G07	11.9	12.0	0.14		
G08	12.0	12.1	0.14		
G09	10.1	10.1	0.03		
G10	10.0	10.0	0.02		
G11	10.1	10.1	0.03		
G12	9.9	10.0	0.02		
G13	12.1	12.3	0.15		
G14	12.1	12.3	0.15		
G15	12.0	12.1	0.15		
G16	11.9	12.1	0.14		
G17	11.2	11.3	0.09		
G18	11.2	11.2	0.09		
G19	11.2	11.3	0.09		
G20	11.3	11.4	0.09		
G21	11.3	11.3	0.09		
G22	11.6	11.7	0.12		
G23	11.7	11.8	0.12		
G24	12.0	12.2	0.15		
G25	12.0	12.2	0.15		
G26	12.1	12.3	0.15		
G27	12.1	12.2	0.15		
G28	12.0	12.2	0.15		
G29	11.7	11.8	0.13		
G30	11.1	11.2	0.08		
G31	12.1	12.3	0.15		
G32	10.3	10.3	0.03		
G33	10.3	10.4	0.03		
G34	10.4	10.4	0.03		
G35	10.3	10.4	0.03		

Notes:
Bold indicates an exceedance of the annual mean objective.

APPENDIX G – OPERATIONAL PHASE IMPACT CONCENTRATIONS – WITHOUT CUMULATIVE TRAFFIC

2026 Baseline + Proposed development Traffic

Table G. 1 - 2026 Development Impacts on NO_2 Annual Mean Concentrations

Receptors	2026 Baseline (µg/m^3)	2026 Baseline + Operational Traffic (µg/m^3)	Concentration Increase (µg/m^3)	Change of Objective %	Impact Descriptor
		Residential Receptors			
R01	16.9	17.8	0.97	2-5%	Negligible
R02	17.2	18.3	1.05	2-5%	Negligible
R03	18.3	19.6	1.24	2-5%	Negligible
R04	20.8	22.4	1.65	2-5%	Negligible
R05	22.3	24.2	1.90	2-5%	Negligible
R06	24.2	26.4	2.22	6-10%	Slight
R07	21.1	22.8	1.71	2-5%	Negligible
R08	21.8	23.6	1.80	2-5%	Negligible
R09	22.4	24.2	1.87	2-5%	Negligible
R10	22.9	24.8	1.94	2-5%	Negligible
R11	29.4	32.3	2.87	6-10%	Moderate
R12	26.9	29.3	2.49	6-10%	Slight
R13	16.0	16.8	0.78	2-5%	Negligible
R14	15.8	16.6	0.76	2-5%	Negligible
R15	15.4	16.1	0.70	2-5%	Negligible
R16	15.5	16.2	0.71	2-5%	Negligible
R17	17.3	18.3	1.01	2-5%	Negligible
R18	17.6	18.6	1.05	2-5%	Negligible
R19	16.7	17.6	0.91	2-5%	Negligible
R20	23.2	25.2	1.96	2-5%	Negligible
R21	23.6	25.6	2.00	2-5%	Negligible
R22	26.1	28.4	2.37	6-10%	Slight
R23	25.0	27.2	2.20	6-10%	Slight
R24	22.7	24.5	1.75	2-5%	Negligible
R25	17.5	18.5	1.03	2-5%	Negligible
R26	23.4	25.3	1.84	2-5%	Negligible
R27	23.0	24.9	1.86	2-5%	Negligible
R28	25.8	28.1	2.24	6-10%	Slight

Receptors	2026 Baseline (µg/m³)	2026 Baseline + Operational Traffic (µg/m³)	Concentration Increase (µg/m³)	Change of Objective %	Impact Descriptor
R29	55.1	60.2	5.09	>10%	Substantial
R30	50.7	55.3	4.69	>10%	Substantial
R31	27.6	30.1	2.51	6-10%	Slight
R32	17.9	19.1	1.15	2-5%	Negligible
R33	18.4	19.5	1.17	2-5%	Negligible
R34	18.3	19.5	1.16	2-5%	Negligible
R35	16.6	17.6	0.96	2-5%	Negligible
Short-Term Exposure Receptors					
B01	26.6	28.8	2.25		
B02	35.9	39.7	3.77		
G01	18.3	19.4	1.18		
G02	18.9	20.2	1.31		
G03	20.3	21.9	1.56		
G04	23.4	25.5	2.09		
G05	25.3	27.7	2.39		
G06	27.5	30.3	2.74		
G07	37.1	41.1	4.07		
G08	37.7	41.8	4.13		
G09	20.0	21.2	1.28		
G10	18.0	19.1	1.04		
G11	20.4	21.8	1.37		
G12	17.1	18.0	0.94		
G13	39.4	43.7	4.30		
G14	39.1	43.3	4.22		
G15	37.3	41.3	3.92		
G16	37.1	41.1	3.94		
G17	27.0	29.3	2.37		
G18	26.4	28.7	2.27		
G19	26.5	28.8	2.28		
G20	27.6	30.0	2.39		
G21	27.5	29.9	2.39		
G22	31.6	34.5	2.87		
G23	32.5	35.5	2.97		
G24	38.1	42.0	3.98		
G25	37.5	41.4	3.91		

Receptors	2026 Baseline (µg/m³)	2026 Baseline + Operational Traffic (µg/m³)	Concentration Increase (µg/m³)	Change of Objective %	Impact Descriptor
G26	38.5	42.6	4.04		
G27	37.9	41.9	3.94		
G28	37.3	41.2	3.85		
G29	33.8	37.1	3.30		
G30	25.6	27.7	2.16		
G31	35.2	38.1	2.87		
G32	19.8	21.2	1.37		
G33	20.7	22.2	1.49		
G34	21.5	23.3	1.74		
G35	21.3	23.0	1.72		

Notes:
Bold indicates an exceedance of the annual mean objective (where applicable to receptor type).
Bold and underlined indicates an exceedance of the NO_2 1-hour mean objective.

Table G. 2 - 2026 Development Impacts on PM_{10} Annual Mean Concentrations

Receptors	2026 Baseline (µg/m³)	2026 Baseline + Operational Traffic (µg/m³)	Concentration Increase (µg/m³)	Change of Objective %	Impact Descriptor
Residential Receptors					
R01	16.8	16.8	0.06	0%	Negligible
R02	16.8	16.9	0.06	0%	Negligible
R03	16.9	16.9	0.07	0%	Negligible
R04	17.0	17.1	0.09	0%	Negligible
R05	17.1	17.2	0.11	0%	Negligible
R06	17.2	17.4	0.13	0%	Negligible
R07	18.0	18.1	0.10	0%	Negligible
R08	18.1	18.2	0.10	0%	Negligible
R09	18.1	18.2	0.11	0%	Negligible
R10	18.2	18.3	0.12	0%	Negligible
R11	18.6	18.8	0.18	0%	Negligible
R12	18.4	18.6	0.16	0%	Negligible
R13	16.8	16.8	0.05	0%	Negligible
R14	16.7	16.8	0.05	0%	Negligible
R15	16.7	16.8	0.05	0%	Negligible
R16	17.7	17.7	0.05	0%	Negligible
R17	17.8	17.9	0.06	0%	Negligible
R18	17.8	17.9	0.07	0%	Negligible
R19	17.8	17.8	0.06	0%	Negligible

Receptors	2026 Baseline (µg/m³)	2026 Baseline + Operational Traffic (µg/m³)	Concentration Increase (µg/m³)	Change of Objective %	Impact Descriptor
R20	18.2	18.3	0.12	0%	Negligible
R21	18.2	18.3	0.12	0%	Negligible
R22	18.4	18.5	0.15	0%	Negligible
R23	18.3	18.4	0.14	0%	Negligible
R24	18.2	18.3	0.12	0%	Negligible
R25	17.8	17.9	0.07	0%	Negligible
R26	18.3	18.4	0.13	0%	Negligible
R27	18.2	18.3	0.12	0%	Negligible
R28	18.4	18.6	0.15	0%	Negligible
R29	24.2	25.1	0.96	2-5%	Negligible
R30	23.3	24.1	0.84	2-5%	Negligible
R31	18.5	18.7	0.17	0%	Negligible
R32	17.8	17.9	0.07	0%	Negligible
R33	17.9	17.9	0.07	0%	Negligible
R34	17.9	17.9	0.07	0%	Negligible
R35	17.7	17.8	0.05	0%	Negligible
Short-Term Exposure Receptors					
B01	19.4	19.7	0.29		
B02	20.4	20.9	0.45		
G01	16.9	17.0	0.07		
G02	16.9	17.0	0.08		
G03	17.0	17.1	0.09		
G04	17.2	17.3	0.12		
G05	17.3	17.5	0.14		
G06	17.5	17.6	0.16		
G07	20.5	21.0	0.46		
G08	20.6	21.1	0.48		
G09	17.1	17.2	0.10		
G10	16.9	17.0	0.08		
G11	17.1	17.2	0.10		
G12	16.8	16.9	0.06		
G13	20.9	21.4	0.52		
G14	20.9	21.4	0.51		
G15	20.7	21.1	0.48		
G16	20.6	21.1	0.47		

Receptors	2026 Baseline (µg/m³)	2026 Baseline + Operational Traffic (µg/m³)	Concentration Increase (µg/m³)	Change of Objective %	Impact Descriptor
G17	19.4	19.7	0.29		
G18	19.3	19.6	0.29		
G19	19.4	19.6	0.29		
G20	19.5	19.8	0.31		
G21	19.5	19.8	0.31		
G22	20.1	20.5	0.39		
G23	20.2	20.7	0.41		
G24	20.7	21.2	0.50		
G25	20.7	21.2	0.49		
G26	20.8	21.3	0.51		
G27	20.8	21.3	0.50		
G28	20.7	21.2	0.49		
G29	20.2	20.7	0.42		
G30	19.2	19.5	0.27		
G31	21.0	21.5	0.51		
G32	18.0	18.1	0.09		
G33	18.0	18.1	0.10		
G34	18.0	18.1	0.10		
G35	18.0	18.1	0.10		

Notes:
Bold indicates an exceedance of the annual mean objective.

Table G. 3 - 2026 Development Impacts on $PM_{2.5}$ Annual Mean Concentrations

Receptors	2026 Baseline (µg/m³)	2026 Baseline + Operational Traffic (µg/m³)	Concentration Increase (µg/m³)	Change of Objective %	Impact Descriptor
Residential Receptors					
R01	9.9	9.9	0.04	0%	Negligible
R02	9.9	10.0	0.04	0%	Negligible
R03	10.0	10.0	0.05	0%	Negligible
R04	10.1	10.1	0.06	0%	Negligible
R05	10.1	10.2	0.07	0%	Negligible
R06	10.2	10.3	0.08	0%	Negligible
R07	10.3	10.4	0.06	0%	Negligible
R08	10.4	10.4	0.07	0%	Negligible
R09	10.4	10.5	0.07	0%	Negligible
R10	10.4	10.5	0.07	0%	Negligible

Receptors	2026 Baseline (µg/m³)	2026 Baseline + Operational Traffic (µg/m³)	Concentration Increase (µg/m³)	Change of Objective %	Impact Descriptor
R11	10.7	10.8	0.12	1%	Negligible
R12	10.6	10.7	0.10	1%	Negligible
R13	9.9	9.9	0.03	0%	Negligible
R14	9.9	9.9	0.03	0%	Negligible
R15	9.9	9.9	0.03	0%	Negligible
R16	10.1	10.1	0.03	0%	Negligible
R17	10.2	10.2	0.04	0%	Negligible
R18	10.2	10.2	0.04	0%	Negligible
R19	10.2	10.2	0.04	0%	Negligible
R20	10.4	10.5	0.08	0%	Negligible
R21	10.4	10.5	0.08	0%	Negligible
R22	10.6	10.6	0.09	0%	Negligible
R23	10.5	10.6	0.09	0%	Negligible
R24	10.4	10.5	0.07	0%	Negligible
R25	10.2	10.2	0.04	0%	Negligible
R26	10.5	10.5	0.08	0%	Negligible
R27	10.4	10.5	0.08	0%	Negligible
R28	10.6	10.7	0.09	0%	Negligible
R29	14.1	14.7	0.58	2-5%	Negligible
R30	13.6	14.1	0.51	2-5%	Negligible
R31	10.6	10.7	0.11	1%	Negligible
R32	10.2	10.2	0.04	0%	Negligible
R33	10.2	10.3	0.05	0%	Negligible
R34	10.2	10.3	0.05	0%	Negligible
R35	10.1	10.2	0.03	0%	Negligible
Short-Term Exposure Receptors					
B01	11.2	11.4	0.18		
B02	11.8	12.1	0.29		
G01	10.0	10.0	0.05		
G02	10.0	10.0	0.05		
G03	10.0	10.1	0.06		
G04	10.2	10.2	0.08		
G05	10.2	10.3	0.09		
G06	10.3	10.4	0.10		
G07	11.9	12.2	0.30		

Receptors	2026 Baseline (µg/m^3)	2026 Baseline + Operational Traffic (µg/m^3)	Concentration Increase (µg/m^3)	Change of Objective %	Impact Descriptor
G08	12.0	12.3	0.31		
G09	10.1	10.1	0.06		
G10	10.0	10.0	0.05		
G11	10.1	10.2	0.06		
G12	9.9	10.0	0.04		
G13	12.1	12.4	0.33		
G14	12.1	12.4	0.33		
G15	12.0	12.3	0.31		
G16	11.9	12.2	0.30		
G17	11.2	11.4	0.18		
G18	11.1	11.3	0.18		
G19	11.2	11.3	0.18		
G20	11.2	11.4	0.19		
G21	11.2	11.4	0.19		
G22	11.6	11.9	0.24		
G23	11.7	12.0	0.26		
G24	12.0	12.4	0.32		
G25	12.0	12.3	0.31		
G26	12.1	12.4	0.32		
G27	12.1	12.4	0.32		
G28	12.0	12.3	0.31		
G29	11.7	12.0	0.26		
G30	11.1	11.2	0.17		
G31	12.1	12.4	0.31		
G32	10.3	10.3	0.06		
G33	10.3	10.4	0.06		
G34	10.3	10.4	0.06		
G35	10.3	10.4	0.06		

Notes:
Bold indicates an exceedance of the annual mean objective.

APPENDIX H – OPERATIONAL PHASE IMPACT CONCENTRATIONS – WITH CUMULATIVE TRAFFIC

2026 Baseline + Proposed development Traffic (with Cumulative Traffic)

Table H. 1 - 2026 Development Impacts on NO_2 Annual Mean Concentrations

Receptors	2026 Baseline (µg/m^3)	2026 Baseline + Operational Traffic + Cumulative Traffic (µg/m^3)	Concentration Increase (µg/m^3)	Change of Objective %	Impact Descriptor
Residential Receptors					
R01	16.9	18.1	1.25	2-5%	Negligible
R02	17.2	18.5	1.33	2-5%	Negligible
R03	18.3	19.9	1.56	2-5%	Negligible
R04	20.8	22.8	2.06	2-5%	Negligible
R05	22.3	24.7	2.36	6-10%	Slight
R06	24.2	27.0	2.73	6-10%	Slight
R07	21.1	23.3	2.12	2-5%	Negligible
R08	21.8	24.0	2.24	6-10%	Slight
R09	22.4	24.7	2.34	6-10%	Slight
R10	22.9	25.3	2.42	6-10%	Slight
R11	29.4	33.0	3.59	6-10%	Moderate
R12	26.9	30.0	3.14	6-10%	Slight
R13	16.0	17.1	1.04	2-5%	Negligible
R14	15.8	16.8	1.01	2-5%	Negligible
R15	15.4	16.3	0.93	2-5%	Negligible
R16	15.5	16.4	0.93	2-5%	Negligible
R17	17.3	18.6	1.30	2-5%	Negligible
R18	17.6	18.9	1.36	2-5%	Negligible
R19	16.7	17.9	1.19	2-5%	Negligible
R20	23.2	25.7	2.48	6-10%	Slight
R21	23.6	26.1	2.55	6-10%	Slight
R22	26.1	29.1	3.00	6-10%	Slight
R23	25.0	27.7	2.79	6-10%	Slight
R24	22.7	25.0	2.29	6-10%	Slight
R25	17.5	18.8	1.34	2-5%	Negligible
R26	23.4	25.8	2.42	6-10%	Slight
R27	23.0	25.4	2.39	6-10%	Slight

Receptors	2026 Baseline (µg/m^3)	2026 Baseline + Operational Traffic + Cumulative Traffic (µg/m^3)	Concentration Increase (µg/m^3)	Change of Objective %	Impact Descriptor
R28	25.8	28.7	2.88	6-10%	Slight
R29	55.1	62.0	6.93	>10%	Substantial
R30	50.7	57.0	6.36	>10%	Substantial
R31	27.6	30.8	3.20	6-10%	Moderate
R32	17.9	19.4	1.46	2-5%	Negligible
R33	18.4	19.9	1.51	2-5%	Negligible
R34	18.3	19.8	1.50	2-5%	Negligible
R35	16.6	17.8	1.20	2-5%	Negligible
Short-Term Exposure Receptors					
B01	26.6	29.5	2.95		
B02	35.9	40.6	4.72		
G01	18.3	19.8	1.52		
G02	18.9	20.6	1.66		
G03	20.3	22.2	1.95		
G04	23.4	26.0	2.58		
G05	25.3	28.2	2.94		
G06	27.5	30.9	3.36		
G07	37.1	42.0	4.98		
G08	37.7	42.8	5.06		
G09	20.0	21.7	1.73		
G10	18.0	19.4	1.40		
G11	20.4	22.3	1.83		
G12	17.1	18.3	1.24		
G13	39.4	44.7	5.28		
G14	39.1	44.3	5.22		
G15	37.3	42.2	4.89		
G16	37.1	42.0	4.89		
G17	27.0	30.0	3.06		
G18	26.4	29.4	2.95		
G19	26.5	29.5	2.97		
G20	27.6	30.7	3.13		
G21	27.5	30.6	3.13		
G22	31.6	35.4	3.78		
G23	32.5	36.5	3.92		
G24	38.1	43.1	5.02		

Receptors	2026 Baseline (µg/m³)	2026 Baseline + Operational Traffic + Cumulative Traffic (µg/m³)	Concentration Increase (µg/m³)	Change of Objective %	Impact Descriptor
G25	37.5	42.4	4.93		
G26	38.5	43.6	5.08		
G27	37.9	42.9	4.95		
G28	37.3	42.2	4.84		
G29	33.8	38.0	4.21		
G30	25.6	28.4	2.81		
G31	35.2	39.2	4.02		
G32	19.8	21.6	1.77		
G33	20.7	22.6	1.93		
G34	21.5	23.7	2.17		
G35	21.3	23.4	2.13		

Notes:
Bold indicates an exceedance of the annual mean objective (where applicable to receptor type).
Bold and underlined indicates an exceedance of the NO_2 1-hour mean objective.

Table H. 2 - 2026 Development Impacts on PM_{10} Annual Mean Concentrations

Receptors	2026 Baseline (µg/m³)	2026 Baseline + Operational Traffic + Cumulative Traffic (µg/m³)	Concentration Increase (µg/m³)	Change of Objective %	Impact Descriptor
Residential Receptors					
R01	16.8	16.9	0.08	0%	Negligible
R02	16.8	16.9	0.08	0%	Negligible
R03	16.9	17.0	0.10	0%	Negligible
R04	17.0	17.2	0.13	0%	Negligible
R05	17.1	17.3	0.15	0%	Negligible
R06	17.2	17.4	0.17	0%	Negligible
R07	18.0	18.2	0.13	0%	Negligible
R08	18.1	18.2	0.14	0%	Negligible
R09	18.1	18.3	0.15	0%	Negligible
R10	18.2	18.3	0.16	0%	Negligible
R11	18.6	18.9	0.25	1%	Negligible
R12	18.4	18.7	0.22	1%	Negligible
R13	16.8	16.8	0.07	0%	Negligible
R14	16.7	16.8	0.07	0%	Negligible
R15	16.7	16.8	0.06	0%	Negligible
R16	17.7	17.8	0.06	0%	Negligible
R17	17.8	17.9	0.09	0%	Negligible

Receptors	2026 Baseline (µg/m^3)	2026 Baseline + Operational Traffic + Cumulative Traffic (µg/m^3)	Concentration Increase (µg/m^3)	Change of Objective %	Impact Descriptor
R18	17.8	17.9	0.09	0%	Negligible
R19	17.8	17.8	0.08	0%	Negligible
R20	18.2	18.3	0.16	0%	Negligible
R21	18.2	18.4	0.17	0%	Negligible
R22	18.4	18.6	0.20	1%	Negligible
R23	18.3	18.5	0.19	0%	Negligible
R24	18.2	18.4	0.16	0%	Negligible
R25	17.8	17.9	0.09	0%	Negligible
R26	18.3	18.4	0.18	0%	Negligible
R27	18.2	18.4	0.16	0%	Negligible
R28	18.4	18.6	0.21	1%	Negligible
R29	24.2	25.5	1.33	2-5%	Negligible
R30	23.3	24.5	1.16	2-5%	Negligible
R31	18.5	18.7	0.23	1%	Negligible
R32	17.8	17.9	0.09	0%	Negligible
R33	17.9	18.0	0.10	0%	Negligible
R34	17.9	18.0	0.10	0%	Negligible
R35	17.7	17.8	0.07	0%	Negligible
Short-Term Exposure Receptors					
B01	19.4	19.8	0.40		
B02	20.4	21.0	0.61		
G01	16.9	17.0	0.10		
G02	16.9	17.0	0.11		
G03	17.0	17.1	0.12		
G04	17.2	17.4	0.16		
G05	17.3	17.5	0.19		
G06	17.5	17.7	0.22		
G07	20.5	21.1	0.63		
G08	20.6	21.2	0.65		
G09	17.1	17.2	0.13		
G10	16.9	17.0	0.10		
G11	17.1	17.2	0.14		
G12	16.8	16.9	0.09		
G13	20.9	21.6	0.70		
G14	20.9	21.6	0.70		

Receptors	2026 Baseline (µg/m³)	2026 Baseline + Operational Traffic + Cumulative Traffic (µg/m³)	Concentration Increase (µg/m³)	Change of Objective %	Impact Descriptor
G15	20.7	21.3	0.66		
G16	20.6	21.2	0.64		
G17	19.4	19.8	0.40		
G18	19.3	19.7	0.39		
G19	19.4	19.8	0.39		
G20	19.5	19.9	0.43		
G21	19.5	19.9	0.42		
G22	20.1	20.6	0.54		
G23	20.2	20.8	0.57		
G24	20.7	21.4	0.68		
G25	20.7	21.3	0.66		
G26	20.8	21.5	0.69		
G27	20.8	21.5	0.68		
G28	20.7	21.4	0.67		
G29	20.2	20.8	0.57		
G30	19.2	19.6	0.37		
G31	21.0	21.7	0.70		
G32	18.0	18.1	0.12		
G33	18.0	18.2	0.13		
G34	18.0	18.2	0.14		
G35	18.0	18.2	0.13		

Notes:
Bold indicates an exceedance of the annual mean objective.

Table H. 3 - 2026 Development Impacts on $PM_{2.5}$ Annual Mean Concentrations

Receptors	2026 Baseline (µg/m³)	2026 Baseline + Operational Traffic + Cumulative Traffic (µg/m³)	Concentration Increase (µg/m³)	Change of Objective %	Impact Descriptor
Residential Receptors					
R01	9.9	10.0	0.05	0%	Negligible
R02	9.9	10.0	0.05	0%	Negligible
R03	10.0	10.0	0.06	0%	Negligible
R04	10.1	10.1	0.08	0%	Negligible
R05	10.1	10.2	0.09	0%	Negligible
R06	10.2	10.3	0.11	1%	Negligible
R07	10.3	10.4	0.08	0%	Negligible

Receptors	2026 Baseline (µg/m^3)	2026 Baseline + Operational Traffic + Cumulative Traffic (µg/m^3)	Concentration Increase (µg/m^3)	Change of Objective %	Impact Descriptor
R08	10.4	10.4	0.09	0%	Negligible
R09	10.4	10.5	0.10	0%	Negligible
R10	10.4	10.5	0.10	1%	Negligible
R11	10.7	10.9	0.16	1%	Negligible
R12	10.6	10.7	0.14	1%	Negligible
R13	9.9	9.9	0.05	0%	Negligible
R14	9.9	9.9	0.04	0%	Negligible
R15	9.9	9.9	0.04	0%	Negligible
R16	10.1	10.2	0.04	0%	Negligible
R17	10.2	10.2	0.05	0%	Negligible
R18	10.2	10.3	0.06	0%	Negligible
R19	10.2	10.2	0.05	0%	Negligible
R20	10.4	10.5	0.10	1%	Negligible
R21	10.4	10.5	0.11	1%	Negligible
R22	10.6	10.7	0.13	1%	Negligible
R23	10.5	10.6	0.12	1%	Negligible
R24	10.4	10.5	0.10	1%	Negligible
R25	10.2	10.2	0.06	0%	Negligible
R26	10.5	10.6	0.11	1%	Negligible
R27	10.4	10.5	0.10	1%	Negligible
R28	10.6	10.7	0.13	1%	Negligible
R29	14.1	14.9	0.81	2-5%	Negligible
R30	13.6	14.3	0.71	2-5%	Negligible
R31	10.6	10.8	0.14	1%	Negligible
R32	10.2	10.3	0.06	0%	Negligible
R33	10.2	10.3	0.06	0%	Negligible
R34	10.2	10.3	0.06	0%	Negligible
R35	10.1	10.2	0.05	0%	Negligible
Short-Term Exposure Receptors					
B01	11.2	11.4	0.25		
B02	11.8	12.2	0.39		
G01	10.0	10.0	0.06		
G02	10.0	10.1	0.07		
G03	10.0	10.1	0.08		
G04	10.2	10.3	0.10		

Receptors	2026 Baseline (µg/m^3)	2026 Baseline + Operational Traffic + Cumulative Traffic (µg/m^3)	Concentration Increase (µg/m^3)	Change of Objective %	Impact Descriptor
G05	10.2	10.4	0.12		
G06	10.3	10.5	0.14		
G07	11.9	12.3	0.40		
G08	12.0	12.4	0.41		
G09	10.1	10.2	0.08		
G10	10.0	10.0	0.06		
G11	10.1	10.2	0.09		
G12	9.9	10.0	0.05		
G13	12.1	12.6	0.45		
G14	12.1	12.6	0.44		
G15	12.0	12.4	0.42		
G16	11.9	12.3	0.41		
G17	11.2	11.4	0.25		
G18	11.1	11.4	0.24		
G19	11.2	11.4	0.25		
G20	11.2	11.5	0.26		
G21	11.2	11.5	0.26		
G22	11.6	11.9	0.33		
G23	11.7	12.0	0.35		
G24	12.0	12.5	0.43		
G25	12.0	12.4	0.42		
G26	12.1	12.5	0.44		
G27	12.1	12.5	0.43		
G28	12.0	12.4	0.42		
G29	11.7	12.1	0.36		
G30	11.1	11.3	0.23		
G31	12.1	12.6	0.43		
G32	10.3	10.4	0.08		
G33	10.3	10.4	0.08		
G34	10.3	10.4	0.09		
G35	10.3	10.4	0.08		

Notes:
Bold indicates an exceedance of the annual mean objective.

APPENDIX I – MODEL VERIFICATION PROCESS

Model verification studies are undertaken in order to check the performance of dispersion models and, where modelled concentrations are significantly different to monitored concentrations, a factor can be established by which the modelled results can be adjusted in order to improve their reliability. The model verification process is detailed in LAQM TG(22)).

According to LAQM TG(22)), no adjustment factor is necessary where the results of the model all lie within 25% of the monitored concentrations, but ideally within 10%.

Model verification can only normally be undertaken where there is sufficient roadside monitoring data in the vicinity of the subject scheme being assessed, however kerbside sites can be included within the assessment if they are representative of exposure. LAQM TG(22) recommends that a combination of automatic and diffusion tube monitoring data is used; although this may be limited by data availability. For this assessment, four diffusion tubes were used to verify against, three at kerbside locations and one at roadside locations, and one automatic monitor located at a roadside location. To note, DT45 was discounted from the verification as it was more representative of a suburban location (in line with TG(22)), rather than a roadside location as it is listed in the latest ASR. DT46 was scoped in as it was more representative of a roadside location (in line with TG(22)), rather than a suburban location as it is listed in the latest ASR

VERIFICATION A – ROADSIDE ADJUSTMENT FACTOR

NO_2

Table I.1 sets out the monitored and modelled NO_2 concentrations at the selected monitoring locations.

Table I. 1 - NO_2 Verification Process

ID Site	Measured Annual Mean (NO_2) ($\mu g/m^3$)	Modelled Annual Mean (NO_2) ($\mu g/m^3$)	*%Diff
DT46	25.8	19.2	-25.4
CM7	19.1	17.3	-9.3

*((modelled-monitored)/monitored x 100).

The data in Table I.1 shows that the model is under-predicting NO_2 concentrations. This is not unusual and is likely down the dispersion conditions within the village.

As the model is underpredicting by more than 25% at one monitor, an adjustment factor an adjustment factor has been derived to ensure a conservative assessment is undertaken and improve the accuracy of the model.

As it is primary NO_x, rather than secondary NO_2 emissions that are modelled, adjustment factors must be derived for the road contribution of NO_x. A ratio of the modelled versus monitored NO_x concentrations has been undertaken to derive average adjustment factors, as set out in Table I.2.

Table I. 2 - Deriving the Adjustment Factor

ID Site	Monitored Road NO_x (µg/m^3)	Modelled Road NO_x (µg/m^3)	Ratio
DT46	26.1	13.1	1.774
CM7	12.8	9.4	

Table I.3 compares monitored and modelled NO_2 concentrations at the monitoring locations after the adjustment factor has been applied.

Table I. 3 - Comparison of Monitored and Adjusted Modelled NO_2 Concentrations

ID Site	Measured Annual Mean (NO_2) (µg/m^3)	Modelled Annual Mean (NO_2) (µg/m^3)	*%Diff
DT46	25.8	24.4	-5.3
CM7	19.1	21.1	10.6

*(modelled-monitored)/monitored x 100).

The data in Table I.3 shows that all NO_2 concentrations in the model are now within 25% of monitored values, with one with the ideal +/- 10% indicating that the model is performing acceptably.

ROOT MEAN SQUARE ERROR

A Root Mean Square Error (RMSE) has been calculated in Table I.4 to determine the error within the calculations after Road-NO_x adjustment, based upon the following calculation:

$$RMSE = \sqrt{\frac{1}{N}\sum_{i=1}^{N}(obs_i - Pred_i)^2}$$

Table I. 4- Root Mean Squared Error

ID Site	Concentrations (µg/m^3)		
	Measured Annual Mean NO_2	Modelled Annual Mean NO_2	Diff
DT46	25.8	24.4	-1.4
CM7	19.1	21.1	2.0
		RMSE	2.9

The calculated RMSE is 2.9 µg/m^3, which correlates to an 7.3% error ratio. The RMSE means that modelled results could be under or over predicting pollution concentrations by +/- 2.9 µg/m^3. The RMSE means that modelled results are acceptable, as they are within a 25% margin of error (as advised in LAQM TG(22)) and the ideal +/- 10% margin, and therefore no further adjustment factor is required.

FRACTIONAL BIAS

The fractional bias (FB) has been calculated in Table I.5 to identify if the model shows a systematic tendency to over or under-predict. The following formula has been used to calculate the fractional bias:

$$FB = \frac{(Avg.Obs - Avg.Pred)}{0.5\ (Avg.Obs + Avg.Pred)}$$

Table I. 5- Fractional Bias

Average Observed Values (µg/m^3)	Average Predicted Values (µg/m^3)	Fractional Bias
22.4	22.7	-0.014

The calculated fractional bias is -0.014 which indicates that the model is slightly overpredicting. However, the fractional bias is close to the ideal value of 0, which suggests that the model is performing acceptably.

PARTICULATE MATTER (PM_{10}) VERIFICATION

Table I.6 sets out the monitored and modelled PM_{10} concentrations at the selected monitoring locations.

Table I. 6 – PM_{10} Verification Process

ID Site	Measured Annual Mean (NO_2) (µg/m^3)	Modelled Annual Mean (NO_2) (µg/m^3)	*%Diff
CM7	12.6	18.4	46.2

*((modelled-monitored)/monitored x 100).

The data in Table I.6 shows that the model is over-predicting NO_2 concentrations. On this basis an adjustment factor has not been calculated as the model is already representing a worst case assessment.

PARTICULATE MATTER ($PM_{2.5}$) VERIFICATION

Table I.7 sets out the monitored and modelled $PM_{2.5}$ concentrations at the selected monitoring locations.

Table I. 7 – $PM_{2.5}$ Verification Process

ID Site	Measured Annual Mean (NO_2) ($\mu g/m^3$)	Modelled Annual Mean (NO_2) ($\mu g/m^3$)	*%Diff
CM7	8.6	10.6	23.7

*((modelled-monitored)/monitored x 100).

The data in Table I.7 shows that the model is over-predicting NO_2 concentrations. On this basis an adjustment factor has not been calculated as the model is already representing a worst case assessment.

VERIFICATION B – KERBSIDE ADJUSTMENT FACTOR

NO_2

Table I.8 sets out the monitored and modelled NO_2 concentrations at the selected monitoring locations.

Table I.8 - NO_2 Verification Process

ID Site	Measured Annual Mean (NO_2) ($\mu g/m^3$)	Modelled Annual Mean (NO_2) ($\mu g/m^3$)	*%Diff
DT47	54.2	32.7	-39.6
DT48	61.1	31.1	-49.1
DT44	52.0	30.6	-41.2

*((modelled-monitored)/monitored x 100).

The data in Table I.8 show that the model is under-predicting NO_2 concentrations. This is not unusual and is likely to be the result of a number of factors, including local dispersion conditions.

As the model is underpredicting by more than 25%, a derivation of an adjustment has been conducted to ensure a robust assessment.

As it is primary NO_x, rather than secondary NO_2, emissions that are modelled, adjustment factors must be derived for the road contribution of NO_x. A ratio of the modelled versus monitored NO_x concentrations has been undertaken to derive average adjustment factors, as set out in Table I.9.

Table I. 9 - Deriving the Adjustment Factor

ID Site	Monitored Road NO_x (µg/m³)	Modelled Road NO_x (µg/m³)	Ratio
DT47	91.9	40.6	2.531
DT48	110.6	37.1	
DT44	86.2	36.0	

Table I.10 compares monitored and modelled NO_2 concentrations at the monitoring locations after the adjustment factor has been applied.

Table I. 10 - Comparison of Monitored and Adjusted Modelled NO_2 Concentrations

ID Site	Measured Annual Mean (NO_2) (µg/m³)	Modelled Annual Mean (NO_2) (µg/m³)	*%Diff
DT47	54.2	58.2	7.4
DT48	61.1	55.0	-10.0
DT44	52.0	53.9	3.7

*(modelled-monitored)/monitored x 100).

The data in Table I.10 shows that the NO_2 concentrations in the model are all now within 10% of monitored values, indicating that the model is performing acceptably.

ROOT MEAN SQUARE ERROR

A Root Mean Square Error (RMSE) has been calculated in Table I.11 to determine the error within the calculations after Road-NO_x adjustment, based upon the following calculation:

$$RMSE = \sqrt{\frac{1}{N}\sum_{i=1}^{N}(obs_i - Pred_i)^2}$$

Table I. 11- Root Mean Squared Error

ID Site	Concentrations (µg/m³)		
	Measured Annual Mean NO_2	Modelled Annual Mean NO_2	Diff
DT47	54.2	58.2	4.0
DT48	61.1	55.0	-6.1
DT44	52.0	53.9	1.9
		RMSE	4.4

The calculated RMSE is 4.4 µg/m³, which correlates to an 10.9% error ratio. The RMSE means that modelled results could be under or over predicting pollution concentrations by +/- 4.4

µg/m^3. The RMSE means that modelled results are acceptable, as they are within a 25% margin of error (as advised in LAQM TG(22)), and therefore no further adjustment factor is required.

FRACTIONAL BIAS

The fractional bias (FB) has been calculated in Table I.12 to identify if the model shows a systematic tendency to over or under-predict. The following formula has been used to calculate the fractional bias:

$$FB = \frac{(Avg.Obs - Avg.Pred)}{0.5\ (Avg.Obs + Avg.Pred)}$$

Table I. 12- Fractional Bias

Average Observed Values (µg/m^3)	Average Predicted Values (µg/m^3)	Fractional Bias
55.8	55.7	0.001

The calculated fractional bias is 0.001 which indicates that the model is slightly underpredicting. However, the fractional bias is close to the ideal value of 0, which suggests that the model is performing acceptably.

PARTICULATE MATTER VERIFICATION

As there are no appropriate kerbside PM_{10} or $PM_{2.5}$ monitoring locations within the study area in 2022, the predicted road-PM_{10} and road-$PM_{2.5}$ components have been adjusted using the EFT road-NO_x factor before adding the appropriate background concentration.

APPENDIX J – DAMAGE COST CALULATION

A 'damage costs' assessment has been completed in line with CDC (2022) Air Quality Technical Planning Guidance. This damage cost approach is the same as that set out in the BMBC (2021) Air Quality and Emissions, Good Practice Planning Guidance.

In line with the CDC (2022) guidance, the calculation has been based on the most up to date DEFRA (2023) Air Quality Appraisal: Damage Costs at the time of writing, as well as professional experience of undertaking similar assessments to carry out this valuation exercise. In summary, the method involved the following:

- The relevant emissions of pollutants from the scheme (tonnes per year) were quantified, in this case NO_x and PM_{10} emissions associated with traffic generated by the proposed development; and
- In order to reflect the assumption that willingness to pay for health will rise in line with economic growth; a further uplift of 2% per annum was applied from the current year of known costs (2022), through to 2026, to encompass the first full year of full occupation.

The following assumptions have been built into the damage calculation:

- Total Additional Daily Trips = 1,328 (64 % HGV);
- Year = 2026 (first year of full operational);
- Road Type – Rural;
- Average Distance Travelled = 10 km; and
- Assumed Average Speed = 50 kph (in line with EPUK & IAQM (2017) Guidance).

Table J.1 sets out the uplift central damage costs from 2026, and this calculation has then been multiplied to cover five years.

Table J.1 - Uplifted Central Damage Costs for Road Transport

Pollutant	2026 Average Link Emissions (Tonnes/Annum)	2026 National Damage Costs – Road Transport (£/tonne)	5 Year Present Valuation (£)
NO_x	1.3	12,644.97	£100,758.79
PM_{10}	0.3	56,923.87	£112,680.42
Total			**£176,370.15**

The total damage costs provide an indication as to the costs associated with the effect from the Proposed Development on the village of Hickleton only. The calculated figure will be put towards various mitigation measures set out in Section 7 of this report.